TECHNOLOGY DEPT

LABORATORY FURNISHING AND SCIENTIFIC INSTRUMENT NUMBER

The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. XLVI. No. 1191. SATURDAY, APRIL 25, 1942. 6D. PER COPY: POST FREE 8D.

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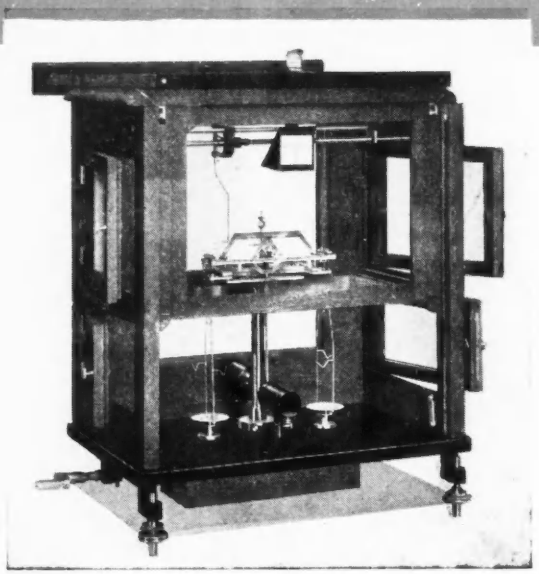

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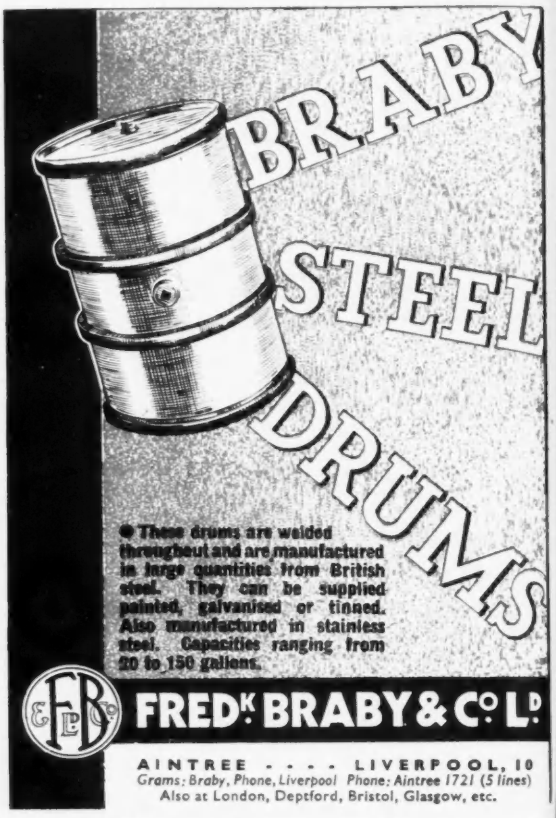

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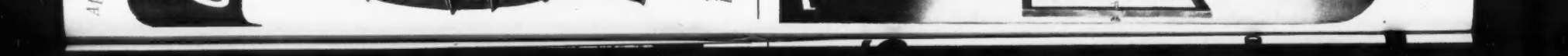

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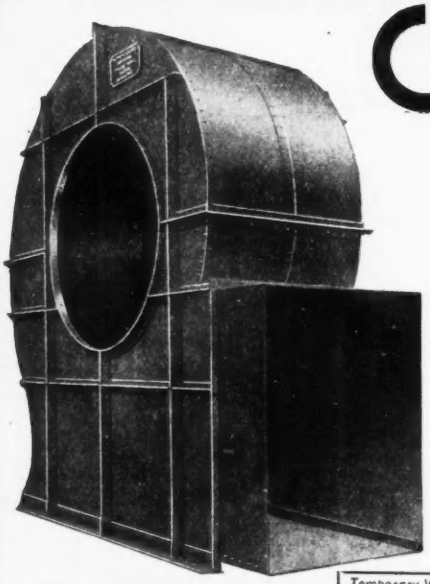

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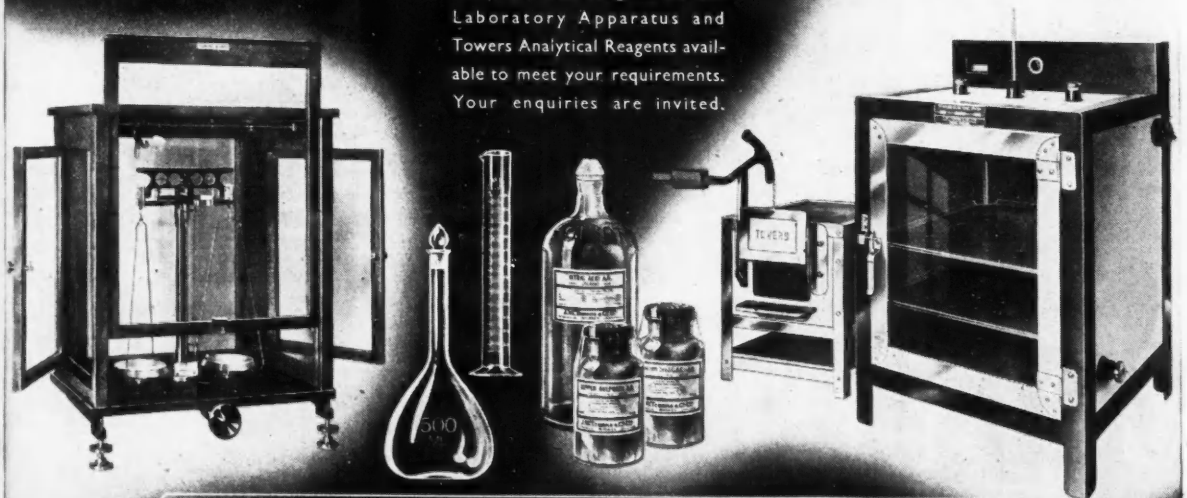

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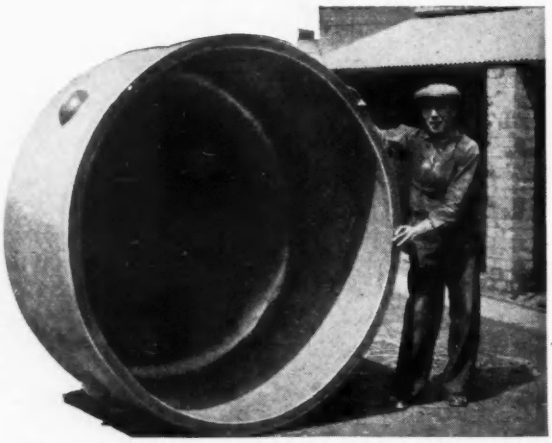

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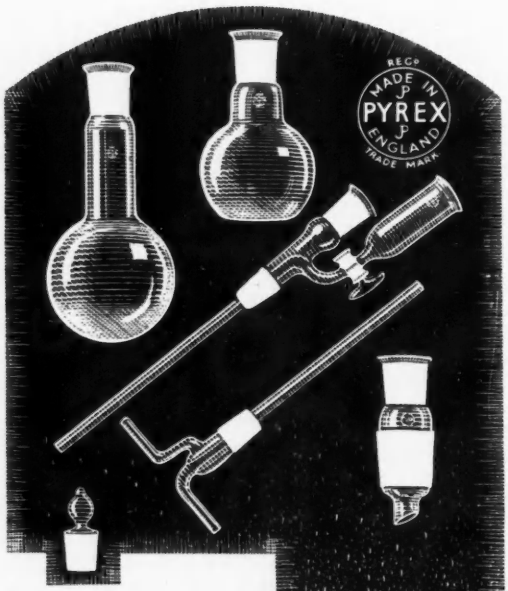

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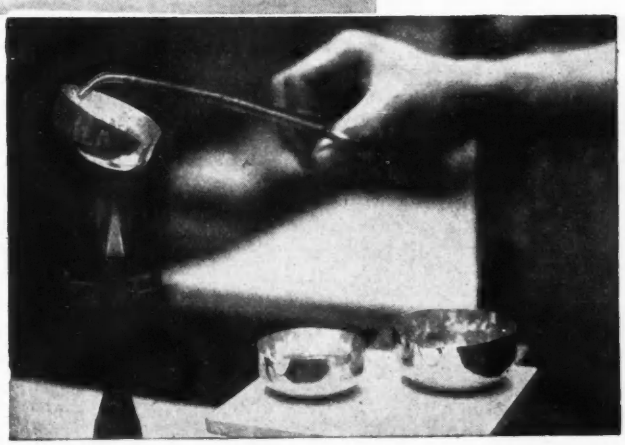

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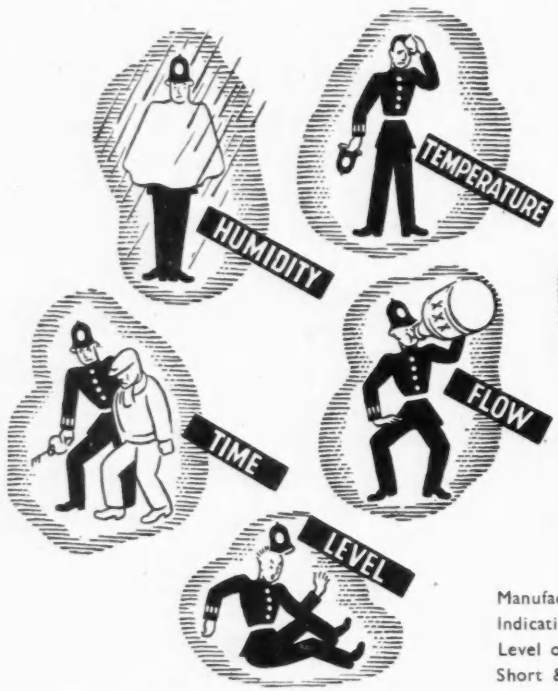

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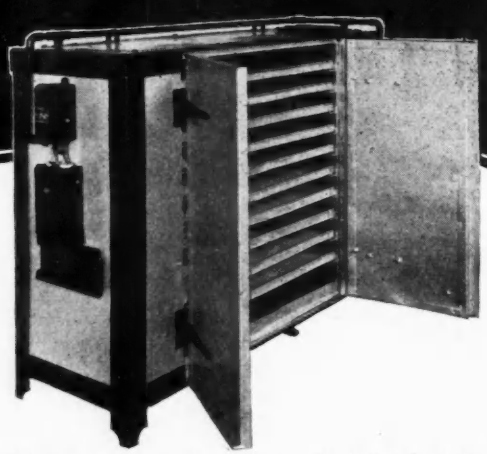

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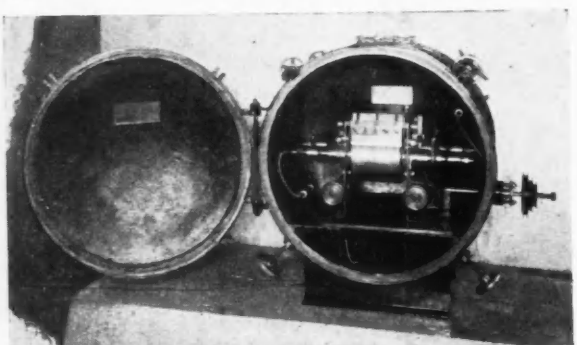

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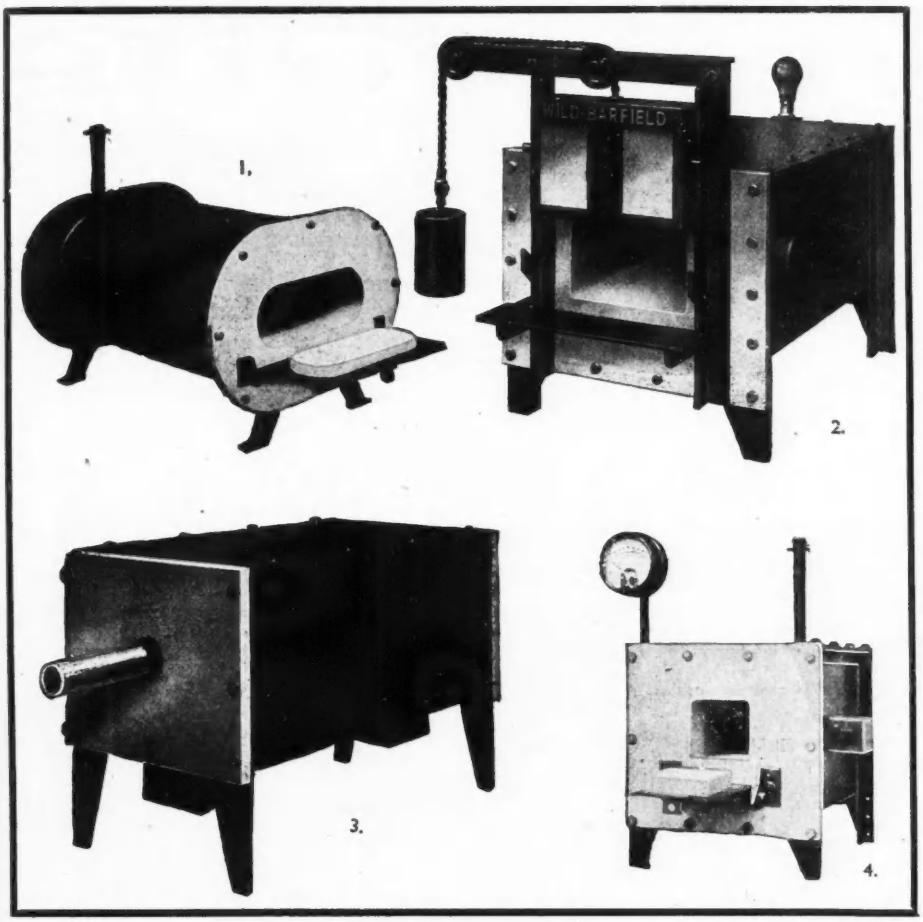

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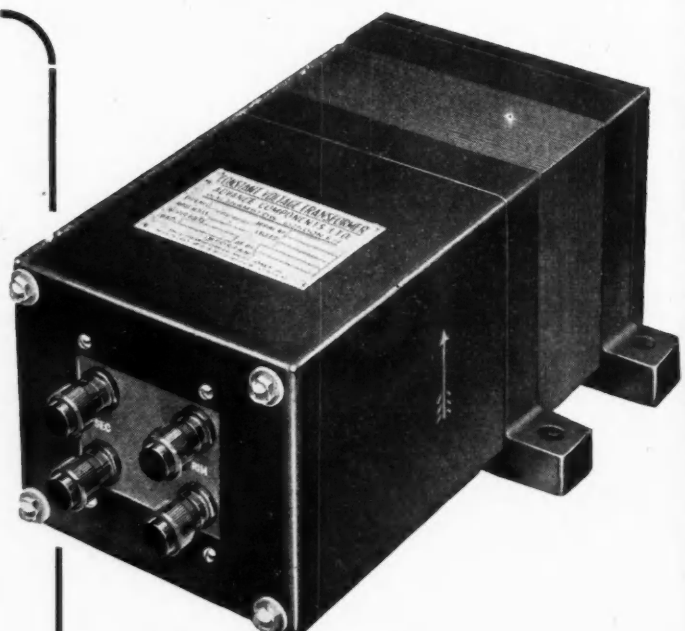

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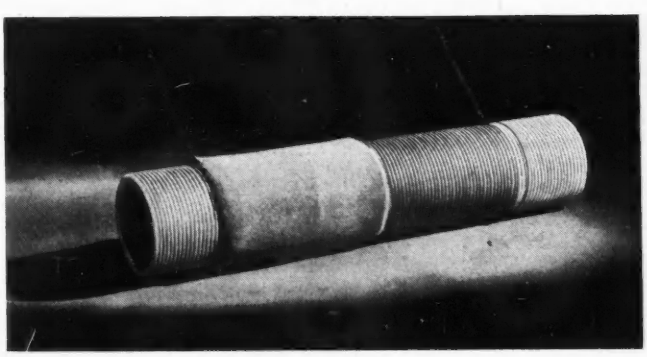

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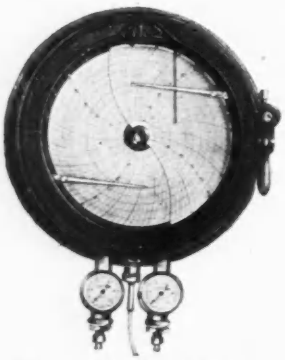

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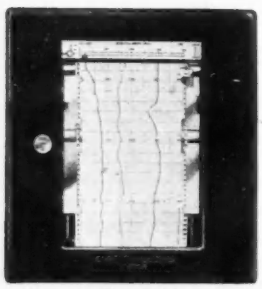

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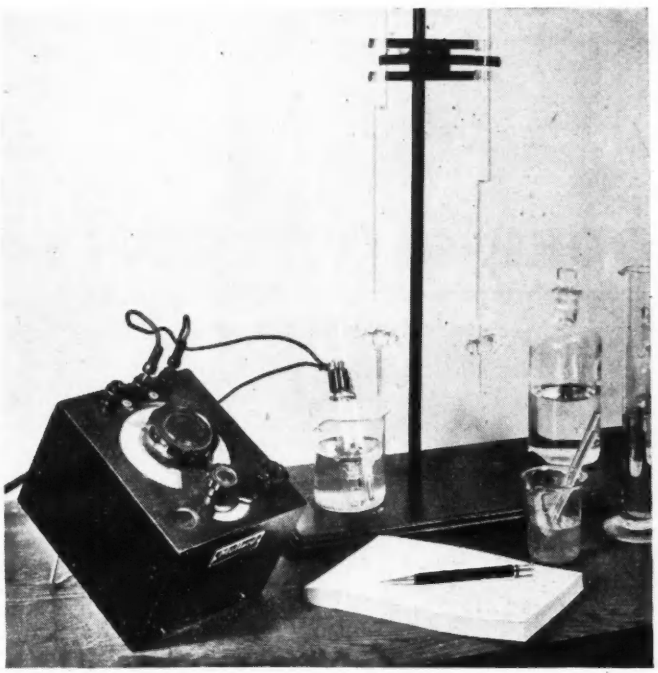

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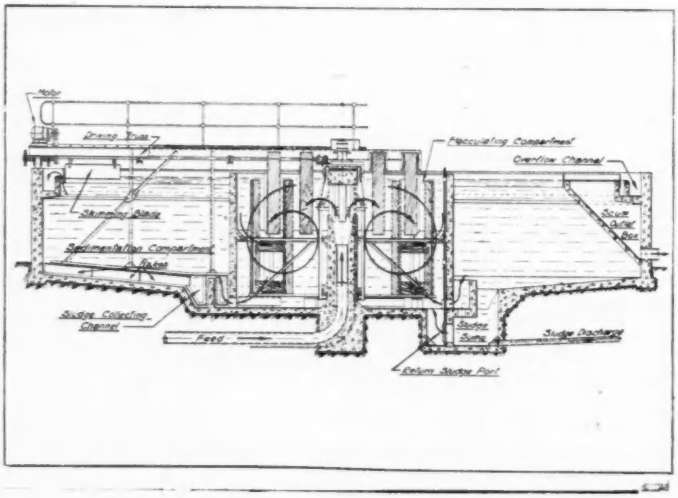

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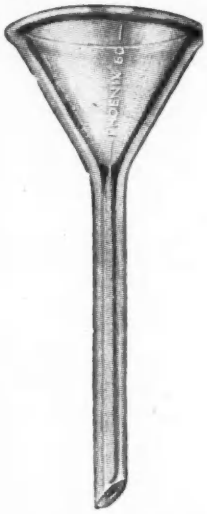

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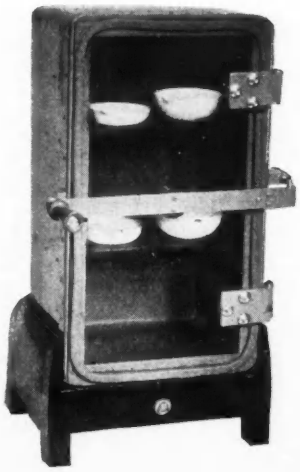

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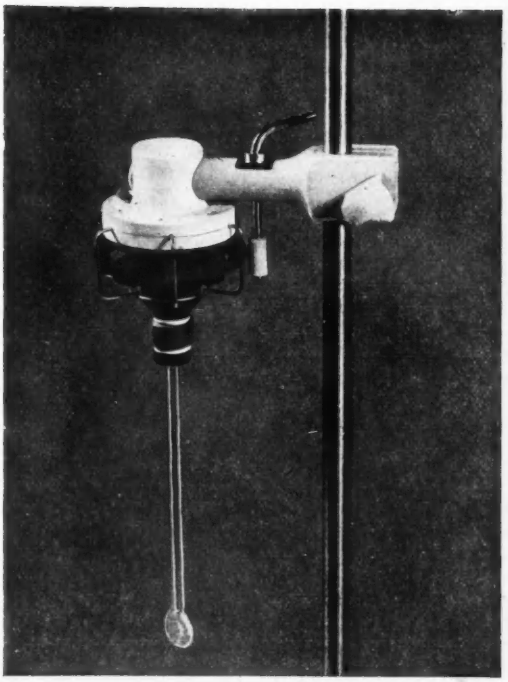

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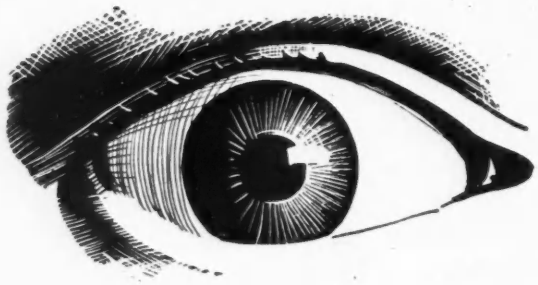

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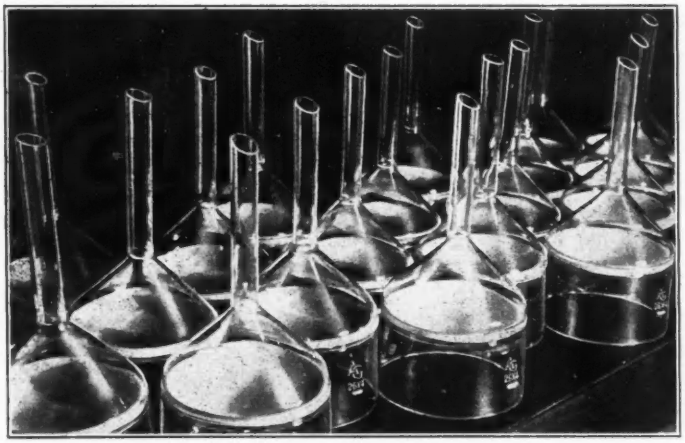

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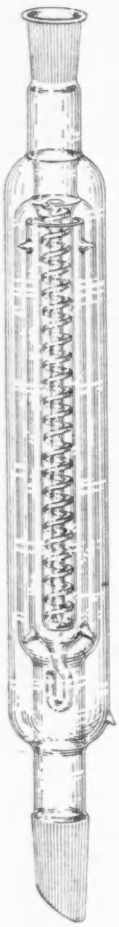

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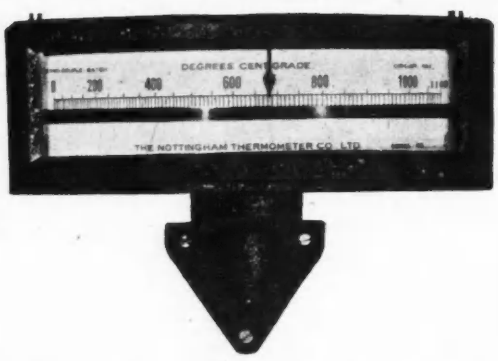

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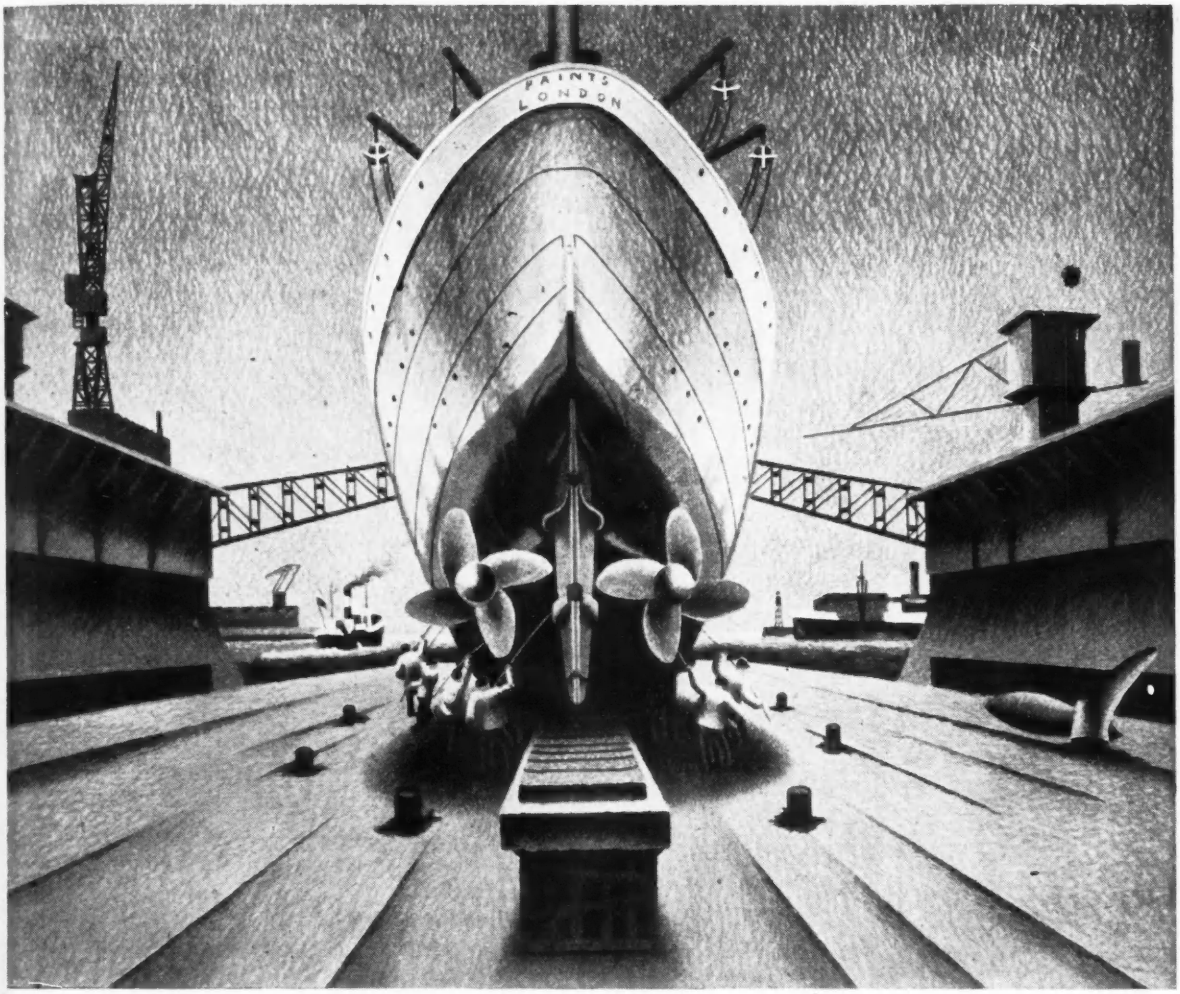
Aspects of an Industry



CORROSION

AN eminent British metallurgist estimated that every year in the world some 30 million tons of steel become unusable by corrosion, that is by rust. This figure must largely be guesswork, but it is an impressive reminder that, though modern skill and knowledge have enabled the builder and engineer of today to improve on the work of their fathers, their greatest achievements are still wasting assets. Steel and cement may replace wood and brick, but for all their strength and hardness, they are not immune from decay. They need protecting from the effects of the atmosphere, from sun and wind and rain and sea water. It is one of the duties of the chemist to see that this protection is given in the shape of better and still better paints. Until recent years paints were simple materials, made from linseed oil or pigments such as white lead. Modern research has completely changed the picture. Today the discovery and production of new protective coverings is a highly scientific part of the British chemical industry, dealing with an ever-growing variety of chemical substances which provide the bases for new resins, lacquers, and finishes : paints specially designed to prevent rust, to stop decay in wood, to resist heat, to imitate stone; lacquers for metal work; dopes for aeroplane and balloon fabrics; finishes of every sort for every sort of article. If protection is in a sense the first requirement of a paint, decoration comes a close second. The demand for more and brighter colours has been steadily growing for years. It has been at once stimulated and satisfied by the happy collaboration between the paint chemist and his opposite number in the dyestuffs and pigment industries. Together they have enabled colour to be applied to a constantly increasing number of articles used in daily life. They contributed to a more gaily coloured world. War has temporarily shrouded their work, but when Peace comes again, they can be relied on to give still better colour worthy of the new world that will be.

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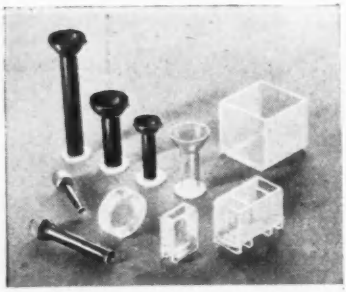

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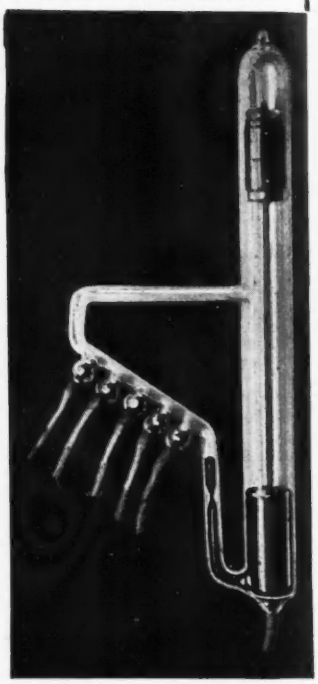

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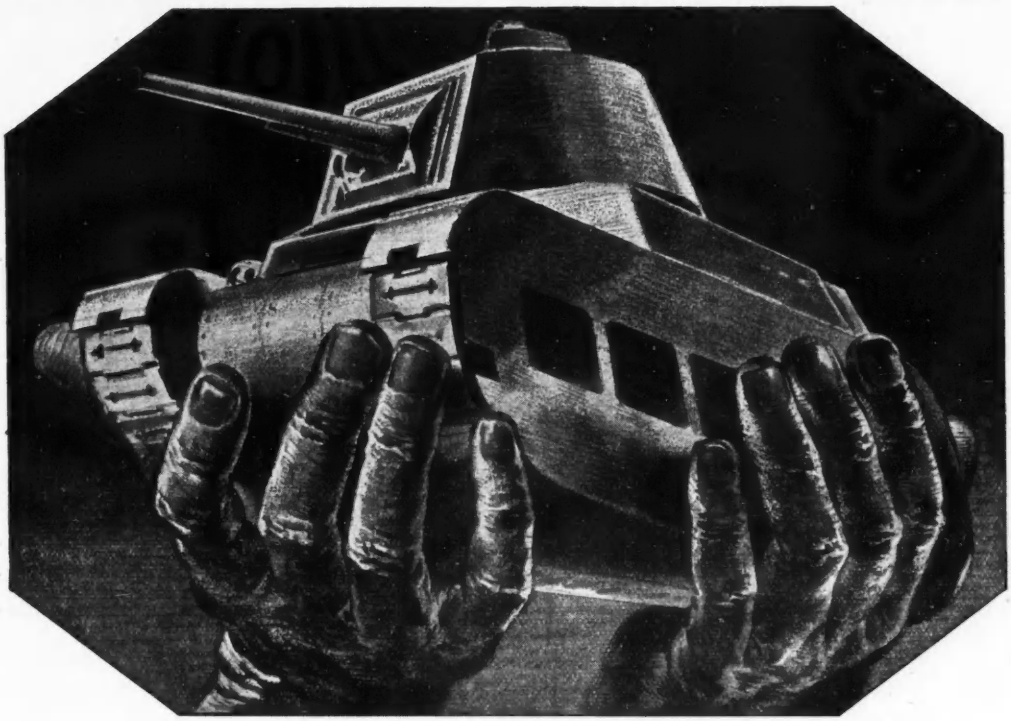

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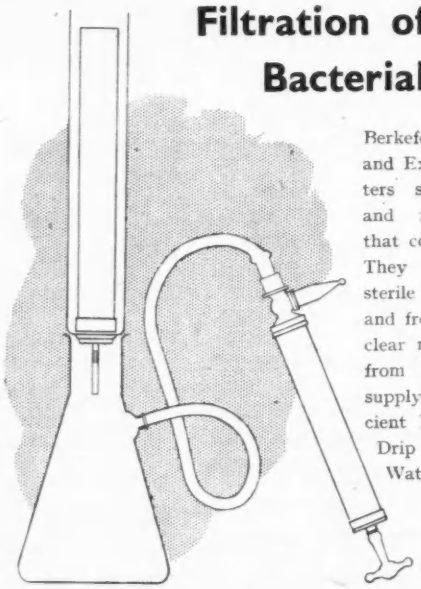

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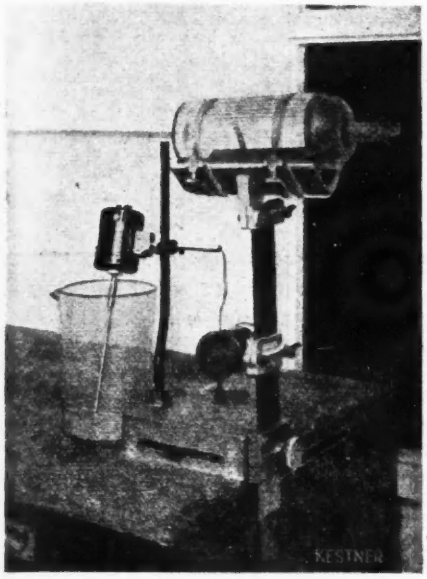

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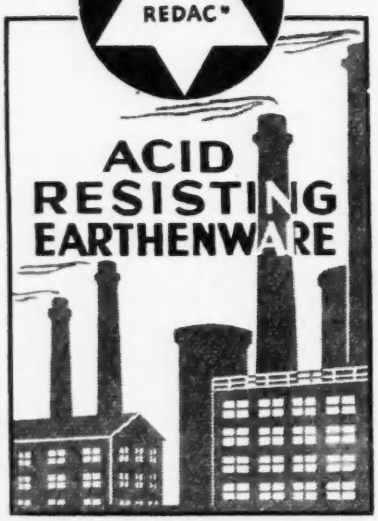

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VOL. XLVI. No. 1191 — April 25, 1942 — Annual Subscription, 21s.

Instruments

A GREAT deal of modern industry is being built up upon the use of instruments. In the earlier days of the application of instruments to industry, their function was often nothing more than that of policemen to ensure that failure on the part of workmen to attend properly to their duties should not go undetected. An example of this is the introduction of gas pressure charts on coke ovens. It was among the duties of the "gas regulator" to adjust the gas pressure in the mains feeding the heating burners to the figure decided upon by the management, and also to operate simple mechanism each 30 minutes whereby the direction of flow of the heating gases was reversed. Failure to attend to these duties—and this was by no means unknown especially on night shift—would either reduce output by lowering the temperature, or would so increase the temperature as to cause overheating, sometimes resulting in melting of the brickwork. Instruments of the policeman variety put a check on wilful neglect and enabled blame to be apportioned if a mistake was made.

Soon instruments began to acquire a deeper significance. Many industrial processes were originally operated by the experience of the workmen, unchecked by measurement. Mr. Harry Brearley in his autobiography, *Knotted String*, records an amusing instance of a steel furnace which had always been operated at temperatures left to the judgment of the foreman guided by some ancient method known as a "water thermometer," the principle of which is not known to us personally. Brearley installed a pyrometer and for a week left it open to inspection; the "readings" of the workmen and the indications of the pyrometer coincided exactly. The next week the pyrometer dial was covered; the two sets of readings showed a wide divergence. The third week the pyrometer was again left open, but a resistance was inserted which caused its readings to be very considerably in error; once again the workmen's estimation and the pyrometer readings coincided. That was the end of the "water thermometer" and thereafter the furnace operated very much more efficiently, a great deal less steel being spoiled.

These two uses of instruments have now been supplemented by a third, the automatic control of industrial processes. To revert to the coke ovens for an example, the gas pressure is now adjusted automatically and the "change-over" mechanism is also operated automatically at stated intervals by suitable time-regulating instruments. Instruments are thus becoming increasingly applied to older industrial processes, with great improvement in the efficiency of the process, with less dependence on the uncertainties of the human factor, with consequent reduction in operating costs, and with improvement in the quality of the product. Newer industries which are based on scientific research are equipped with instruments from the start. It is significant that the Institute of Physics in 1923 chose the name *Journal of Scientific Instruments* for their periodical founded in that year.

It will be evident that a great variety of instruments has been, and will be, required for the purposes detailed above. Often a standard instrument will serve, and the purchaser has the advantage that the cost of design and tools is spread over a great number of units. Frequently no standard instrument is able to do what is required and one must be designed. What should be the procedure under these circumstances is discussed in last December's number of the *Journal of Scientific Instruments* by Dr. M. C. Marsh. His conclusion, in a sentence, is that if a satisfactory result is to be secured there must be complete collaboration between the purchaser and the instrument maker. Standard components can often be used to build up what is required. The instrument maker knows best how to design an instrument with economy in cost and serviceability in operation. The designer should personally see the conditions under which the instrument is to be used so that he may be conversant with the apposite temperatures, possible corrosive atmospheres, vibration, the strength and magnitude of surrounding machinery and so forth, all of which will influence design. Secrecy is inimical to successful design, and the manufacturer should not withhold information in the mistaken belief that the secrecy of his process might be imperilled.

There may be some ambiguity in the remark previously made that the strength and magnitude of surrounding machinery will influence the design of an industrial instrument. Dr. Marsh points out that it is eacy to design an instrument which is far too light and which when installed looks like a toy. "Expressed in terms of screw threads an instrument designer feels that he is getting into heavy engineering if he goes larger than oB.A., whereas a heavy engineer regards 1 in. Whitworth as bordering on the flimsy." When these two types of work are placed in juxtaposition they may appear highly incongruous, and quite frequently an instrument maker may manufacture something which to him seems enormous, but which when installed in position may be too small to be of value. The necessity for complete co-operation between the purchaser and the instrument maker, coupled with a personal inspection by the instrument maker of the situation in which the instrument is to be used, becomes very clear.

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NOTES AND COMMENTS

A Year of Progress in the Laboratory

PERUSAL of the articles contributed to this "Laboratory Furnishing and Scientific Instruments" issue of THE CHEMICAL AGE leads to the conclusion that British manufacturers of these classes of munitions of war (for that is in fact what they are) have undoubtedly played their part during the past year in furthering the national war effort to the best of their ability. For once in a way we did not have to start from scratch: there was in existence, at the beginning of the present war, quite a healthy industry dealing with home-produced laboratory appliances, which had managed to survive from the boom period of the last war despite every official discouragement in the intervening lull. It is sorry work flogging a dead horse, but we should like to record once more that it is due entirely to the skill of the craftsmen concerned and to the enterprise of the individual manufacturers that the laboratory furnishing industries were able to found their war-time development on a stable base. No official aid was offered, nor was any effort made to discourage the inflow into this country of state-subsidised apparatus made abroad.

Co-operation in Design

THAT the chemical industry in general is awake to the importance of laboratory furnishing and design is proved, if proof were needed, by the attention given recently to the subject by the Society of Chemical Industry. Their meeting, in which the topic was fully discussed, is reported elsewhere in our columns. We must confess that the report has a somewhat meagre appearance, considering the importance of the matter; but we must assure our readers that this is due to no neglect on our part. As so often in these days, the most important part of what is revealed during the discussions of a learned or industrial society must not be publicly disclosed. However, an interesting comparison may be made between the design of the British laboratories described by the speakers and the American institutions of similar nature detailed on a later page of this issue. It will be noted, in the American examples, that economy of cost has seldom been necessitated, though a praiseworthy saving of space was often found convenient. In every case, here and abroad, the importance of collaboration between architect and engineer and the actual laboratory staff is seen to be absolutely essential, so varied are the requirements that may be involved.

Accident and Research

A CONTINUED standard of excellence, both as regards matter and production, is maintained in the second number of *Endeavour*, the new quarterly review of the progress of the sciences, of which the first number was reviewed in our columns recently. An imposing array of first-rate authorities is to be seen in the list of contributors, and the contributions published in no way detract from their authors' reputation. Comment on these lines is really needless here, but it is noteworthy that the two principal articles of predominantly chemical interest, "The Significance of Metal Single Crystals," by Professor Andrade, and "Phthalocyanines," by Dr. Cronshaw, have one remarkable feature in common. This is that the work which they describe was in the first instance due to an accident. The preparation of monocrystalline metal rods in 1914, more or less by chance, led to a remarkable sequence of research on their mechanical properties; while from the chance discoloration of a batch of phthalimide sprang the discovery of one of the most valuable of all classes of pigment—nothing less than a new chromophore group. In either case, the mediocre mind might have dismissed the accident as simply a nuisance; the secret of genius is research lies in the ability to seize upon such occurrences as these and to turn them to account towards the furtherance of scientific progress.

Saving Coal for Industry

THE President of the Board of Trade announced in the House of Commons this week the Government's decision to ration domestic consumption of fuel. Coal, coke, gas, electricity, and paraffin are to be rationed on a points system, calculated on present needs and, in addition each individual will have a personal ration. The rationing of coal, coke, and paraffin will start on June 1, while gas and electricity rationing will begin from the last meter reading before August 15. Details of the scheme are still being worked out, and it is already quite evident that Members are prepared to offer a good deal of criticism. From the point of view of the chemical industry, of course, the important part of Mr. Dalton's statement was his expression of the hope that, by means of the rationing scheme, domestic consumption of coal would be reduced by some ten million tons a year. The coal thus saved, it is to be presumed, will go to serve the purposes of industry; and though doubtless the heavy industries will secure the lion's share of the saving, a certain amount of an extremely valuable raw material will be made available to the chemical industry. As a side issue, we permit ourselves to wonder whether any of the coal thus provided will help towards the plans, which are known to have been submitted, for the production of synthetic rubber from coal. At all events, Mr. Dalton has undertaken to give the House a further opportunity, which it evidently desired, for further discussion of the whole matter, and he is consulting representatives of the various interests concerned before the scheme takes final shape.

Canadian Base Metal Resources

WHILE official production figures of the amount of the various metals mined in Canada are not now accessible to the general public, indications point to the attainment of a new record this year, followed by successive increases of the total quantity mined as long as the war continues. In 1941, the value of the base metal mined was $166,157,000 as compared with $155,922,881 in 1940, and now "borderline" producers are being encouraged by tax concessions and other means to make every effort to raise the output of essential war metals. It is predicted that this year's expansion of copper production will be second to that of nickel adone. Additions to zinc concentrating plants are expected to augment Canadian sources during 1942. With only two zinc refineries, one at Trail (British Columbia) and the other at Flin Flon (Manitoba), both working to capacity, Canada has either to build additional refineries or to transport the concentrate to the United States to keep up with the demand for zinc for making munitions. Lead is the only other commonly used base metal that Canada produces in adequate quantity to supply part of the requirements of Great Britain. Most of Canada's copper, lead, and zinc is being marketed in the United Kingdom at contract prices fixed earlier in the war, and this to some extent limits the development of new production of these metals.

Cobalt Recovery Possibilities

COBALT occurs in considerable quantities in the silver-bearing ores of the Cobalt district of Ontario. There are numerous properties from which cobalt ore could readily be derived, including old dumps and abandoned mines, where lessees are recovering cobalt as well as nickel ore. The only refinery in Canada for the recovery of metallic cobalt is producing that metal solely from Northern Rhodesian copper-cobalt matte. Ontario cobalt occurs mainly in combination with silver-nickel and arsenic. The ore is highly complex and refractory and is first concentrated by gravity methods or by flotation and then smelted. If augmented supplies of cobalt are required for war purposes the mines of the Cobalt district offer possibilities, but financial assistance will be necessary for early results. The present rate of depletion of known Canadian base metal resources is emphasising the need for new discoveries to allow stabilisation of the industry as well as to give Canada a greater self-sufficiency in strategic minerals.

Progress in Laboratory Apparatus Design Under War Conditions

by R. H. POWELL

Some striking examples are here recorded to show how the laboratory apparatus industry is contributing to the war effort by making new designs available for purposes important to industry, and is overcoming the difficulties created by a shortage of apparatus and materials formerly imported. Stress is laid on the desirability of close co-operation between laboratory user and apparatus manufacturer for the maintenance of future progress.

CONCENTRATION during war time upon production —"getting the tools to finish the job"—can easily lead to stagnation in design; for whereas in peaceful times competitive effort provides the stimulus to continuous improvement, in war, when a standard design suits a purpose well enough, the tendency is to leave it unchanged, so great is the necessity for maximum production. Progress in design during war time may well, therefore, be found to be confined to those articles for which circumstances call forth a special demand, or for those of which enemy action has cut off the normal source of supply, and has in consequence made it necessary to manufacture items formerly imported. In the first class falls new apparatus designed to meet the needs of new processes, or to speed up, or to render more accurate existing processes. In the second class is placed apparatus important enough to the war effort to justify the straining of every means to provide a substitute for the previously imported type. It often happens that with the background of experience built up by many years' handling of the imported apparatus, radical improvements in design, method of construction, materials used, and ease of operation are possible when arranging for British production. These two classes of apparatus are well illustrated in the following notes.

An apparatus developed specially to meet a heavy wartime demand for rapid methods of alloy analysis is the G. & T. Electrochemical Analysis Apparatus available in two types, the single-unit (Fig. 1) and the five-unit (Fig. 2). Gravimetric electrochemical analysis provides the most rapid, accurate, clean, and convenient methods for determining the composition of a wide range of metals and alloys. The apparatus is basically simple and inexperienced staff can rapidly be trained in its use. The single-unit type comprises a vitreous-enamelled cast-iron stand supporting an acid-proof and fume-proof universal

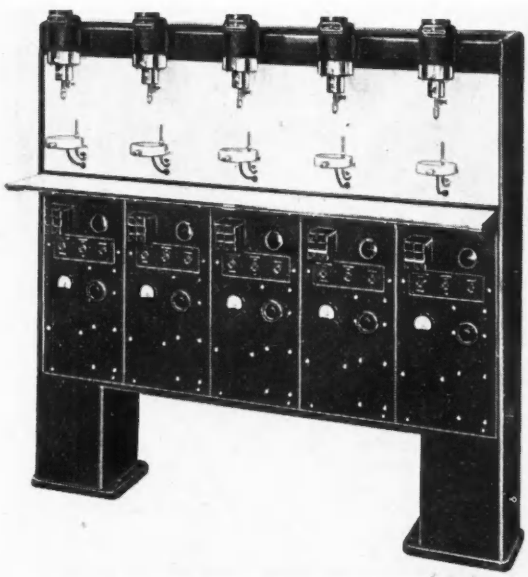


Fig. 2. Modern five-unit electrochemical analysis apparatus

Fig. 1. Modern single-unit electrochemical analysis outfit, showing rectifier unit, with thermostatic control for hot-plate, and platinum electrodes in position

motor fitted with a stainless steel chuck having ebonite jaws to resist corrosion. Mounted on the motor housing is a stainless steel spinning, supporting monel metal terminal clamps for the platinum anode and cathode. The beaker used for the solution undergoing electrolysis stands on a circular table support provided with a heating element to act as a hot-plate. The current unit houses all the controls: a transformer and rectifier whose output is adjustable up to 6 amps at 12 volts D.C., a hot-plate switch and heat control adjustment, an on-off switch for the electrolysing current, a change-over switch for use in reversing the electrode polarity (*e.g.*, to make the outer electrode the anode as when determining lead, which is deposited as PbO_2), and a rheostat for motor speed control. The five-unit apparatus is designed for use in laboratories where much electrolytic work is carried out—some laboratories do upwards of 600 copper determinations a day. Its features embody all those distinctive to the single-unit apparatus, the keynotes to which are corrosion-resistance and ease of manipulation. Each of the electrical units associated with each pair of electrodes is electrically independent of the other four, so that work can be continued with these in the event of an electrical breakdown in one unit. A spare unit can readily be fitted.

The Ströhlein type apparatus (Fig. 3), which before the war was imported from Germany, is familiar to many chemists concerned with determination of carbon in steel. Since a complete carbon combustion can be carried out in less than two minutes, its rapidity and convenience deserve for it a wider recognition. It is not an easy apparatus to make. In parts the glasswork is more than 80 mm. diameter, with internal seals and ground-glass float valves, and its construction, if breakage due to strain is to be avoided, calls for high glassblowing skill. That it is now in successful production at a price comparable with that

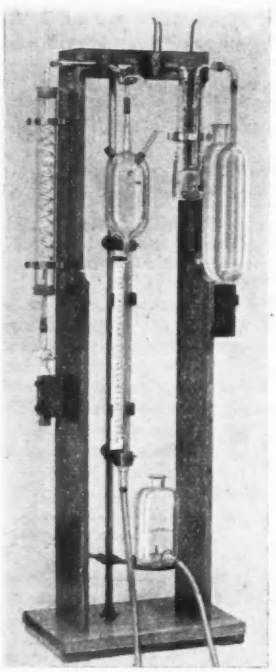
ruling before the war for the German apparatus is surely eloquent testimony that, given demand and opportunity, British craftsmen have no need to fear that their Continental counterparts have a monopoly of either brains or skill. In use, a 0.5-gram sample of drillings in a combustion boat is placed in a tube furnace and maintained at 1200° C. in a current of oxygen. The CO_2 and excess oxygen pass through the cooling coil into the burette. The three-way tap at the top is turned when combustion is complete (about one minute) to connect the absorption system. The gas passes through soda lime, the CO_2 is absorbed, and the gas is then returned to the burette. The diminution in volume is read against a scale calibrated in percentage of carbon, and the result is reduced to the standard conditions of 16° C. and 760 mm. by reference to a correction table. The accuracy of determinations is at least 0.01 per cent., and the rapidity of the method makes it of great importance at the present time.

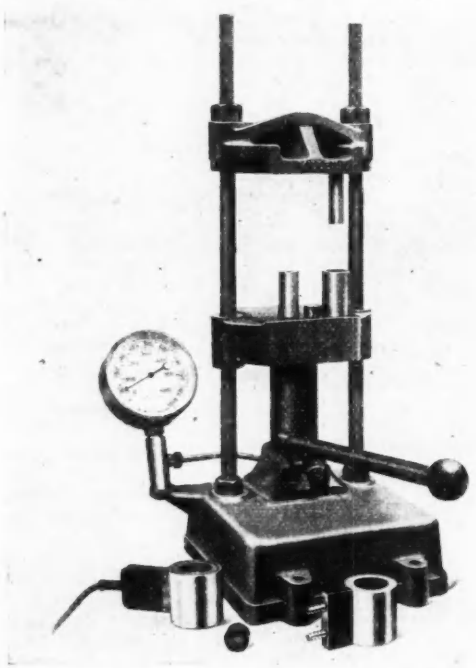
For estimation of sulphur, the combustion method is coming more widely into use. It requires a high-temperature furnace which formerly incorporated the German-made Silit rods. The American Globar rods, while obtainable, though with difficulty, compare unfavourably with the Silit rods in homogeneity of structure and consequent length of life. A new precious-metal-wound furnace has, therefore, been developed, designed to operate at temperatures up to 1350° C., at which an element life of upwards of 1500 hours may be expected. The wound element is enclosed in a refractory tube packed with pure fused alumina, and this is surrounded with magnesium-asbestos lagging in a cement-asbestos case. A Sun-Vic Energy Regulator is fitted, which provides a type of thermostatic control over the whole temperature range. The construction eliminates troubles due to volatilisation of the winding, which have been experienced in the past with precious metal-wound furnaces.

No modern technique of metallographic examination is complete without a press for use in mounting the specimens in Bakelite or in a suitable thermoplastic resin. Small specimens such as pivots, films, filaments, and wires, as well as larger samples, are firmly embedded, can be polished with ease to the extreme edge, and the specimen is protected from damage and deterioration during storage. The press (Fig. 4) is a hydraulic type, exerting a pressure up to 5 tons. Moulds either 1 in. or 1¼ in. diam. are available, together with mould heaters and coolers which reduce the time for a complete mounting to about five minutes. The operation is simple. The specimen is introduced into the mould, which is then filled with the moulding powder, the plunger is inserted and the mould heater (electric) slipped into place over the mould. The pressure is then taken up to about 3000 lb. while the temperature of the mould is raised to about 160° C. or other temperature suitable to the particular moulding powder in use. The heater is then removed and the mould cooler (water-cooled) slipped into place. The pressure is maintained at 2500-3000 lb. during the cooling period, and when the temperature has fallen to about 60-70° C. the specimen can be ejected and allowed to cool finally in air. Transparent or black opaque moulding powders, and storage cabinets for both sizes of specimen are available. The press is adaptable to a variety of other uses, such as extrusion of wires in short lengths, briquette testing, expression of oil from seeds, etc.

Agate mortars and pestles, for long the specialised product of German industry, are now again available—of British manufacture. Their price is considerably higher than the pre-war price of the German article, owing to the fact that the technique for working this extremely hard material (hardness 7 on Moh's scale) has not been developed in this country, and also to the fact that large cutting wheels driven by cheap water power and operated by cheap workers are not a feature of the industry here. However, during war time, supply is the paramount consideration and price becomes of less importance. The finish of the British-made article indicates that here again our craftsmen have nothing to fear from the most exacting comparison with the German articles.

The Kipp's apparatus for the generation of gases in the laboratory has long been standard for the purpose. It possesses many advantages, but is fragile, difficult to clean, has a small capacity, requires frequent recharging,





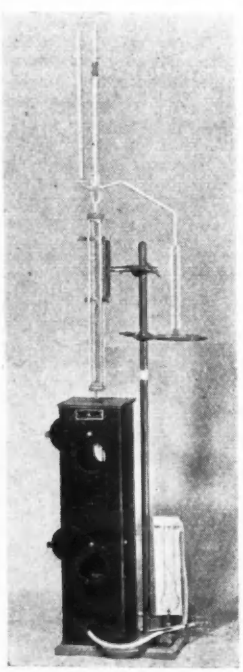


Fig. 3 (left). Ströhlein-type apparatus for use in the determination of carbon in steel. Fig. 4 (centre). Metallurgical mounting-press for the examination of small specimens. Fig. 5 (right). Fractionating column used in estimating toluene in coal-tar spirits

and the ground-glass joints are very liable to seize. Many attempts had been made to improve the design, *e.g.*, the gas generators designed by Friswell, Hosch, Geisel, Wöhler, and others, but all having been glass types utilising the Kipp's principle, the main disadvantages of this apparatus were not eliminated, and the innovations have had no lasting measure of approval. The Microid Gas Generator was the first of its kind to embody the Kipp's principle in a robust stoneware apparatus of large capacity, with screw stoppers instead of ground-glass joints, easy to fill and to clean, and yet withal of pleasing appearance. It can be used for the generation of CO_2, H_2S, hydrogen and other common laboratory gases. It holds 7-14 lb. of solid reactant and 8 litres of acid, and is therefore about 1½ times as large as the largest Kipp's apparatus, the "2-litre" size with 7 in. diam. centre globe. It generates gas at a pressure up to 18 cm. water in volume sufficient to supply at least three, and in many cases six, points from which it can be taken off for the reaction desired. So successful has been this new design that it is now firmly established in hundreds of laboratories throughout this country and the Dominions and Colonies, and there is every probability that the Kipp's apparatus has been banished never to return to the British market.

Fractionating Column

Another apparatus, developed in the Government Laboratory specially to meet a war-time need, is the G.L.1 Fractionating Column for use in the estimation of toluene in those coal tar spirits which, under the provisions of the Control of Toluene (No. 2) Order, 1940, must not contain more than 2 per cent. by volume of toluene. The apparatus (Fig. 5) consists of a metal draught screen with Bunsen burner, screw clip, manometer, and precision screw clip for reading and for accurately adjusting the pressure of the gas supplied to the burner. The fractionation apparatus consists of a 250-ml. flask to which is connected, by a standard ground-glass joint, a fractionating column of 4.3-mm. bore and containing a snugly-fitting spiral of No. 20 s.w.g. Monel metal wire having seven turns to the inch. An air jacket is provided. The reflux head is designed to reduce hold-up to a minimum, and to allow sufficient vapour to reach the thermometer to make its readings accurate and yet not to require distillation at such a rate that fractionation is poor. Distillation is carried out with a 25-ml. sample (or more, depending upon its toluene content), and the distillate is collected at the rate of 1 drop in 8 seconds or about 10 ml per hour. The fraction boiling from 95° C. to 125° C. is collected separately and its volume measured. The toluene content of that fraction is then determined by reference to its specific gravity, its refractive index (for which a special refractometer has been designed), or its critical solution temperature.

A Well-Organised Industry

These examples well illustrate that the supply position of British laboratory apparatus is not during this war in the parlous condition in which the war of 1914-1918 found it. The manufacture of beakers and flasks was then begun in this country for the first time. Round-bottom flasks were produced incapable of standing firmly on a bench without other support. Beakers improperly annealed cracked at the first heating. Improvisation was the order of the day. The industry is now well organised and is capable of fulfilling almost any demands that are likely to be made upon it. Close co-operation between laboratory user and instrument manufacturer marks the sure road to progress in bringing about the wider measure of scientific control of manufacturing processes that is so essential a factor in industrial prosperity. There are increasing signs of its growth in recent years. If it be maintained and fostered, the benefits to the community at large may well prove to be far beyond present computations.

The photographs used to illustrate this article were provided by courtesy of Messrs. Griffin and Tatlock, Ltd., Kemble Street, London, W.C.1.

Laboratory Viscometer

New American Design

ACCURATE and continuous measurement of the viscosity and specific gravity of liquids is made possible by means of a recording instrument recently placed on the market, according to its manufacturers, the Petroleum Instrument Corporation. Originally designed for the measurement of fluids used in drilling oil wells, this instrument has been successfully adapted for use in other industries. A continuous record of viscosity and specific gravity is recorded on a 12-inch, 24-hour, recorder chart. Viscosity is registered in centipoises of absolute viscosity and the gravity in lbs. per cu. ft., lbs. per gallon or specific gravity.

Viscosity measurement is accomplished by a smooth cylindrical solid metallic rotor on the base of the rotor assembly which is submerged in the fluid to a minimum of 4 inches. This is kept revolving at a constant speed of approximately 250 r.p.m. by a small synchronous motor. Turning inside a cage containing six stationary blades, it shears the liquid between its surface and the vanes, thus exerting a torque against the motor that is proportionate to the liquid viscosity. This is then transmitted to a recording dial and registered automatically on a chart. The rotor is suspended on a weighing mechanism so that the buoyant force of the liquid, which is proportioned to the specific gravity, is also transmitted to the instrument in terms of specific gravity.

Light in weight, simple in design and stout in construction, this instrument operates on a 110-volt alternating current. All its parts are contained in one compact unit. Specifications: Height, 5 ft.; width, 6 in.; overall depth, 6 in.; diameter of recorder cabinet, 14 in.; weight (with bracket), 60 lb.

Wood-Impregnation Process

German Method for Dealing with Wet Wood

A NEW process for the impregnation of wood which has been applied successfully to wet wood in Germany uses mainly solid substances such as certain synthetic resins and wax-like materials (lignite, ozokerite) dissolved in trichlorethylene and similar solvents. Impregnation is carried out in a sealed vessel, the solvent being afterwards extracted under pressure, leaving the preservative in the wood. Wet wood can safely be used in the process, because the water is dislodged by the solvent. The impregnated wood is stated to be very hard and not to swell. It is claimed to be very useful for inlaid floors as it saves polish, but for railway sleepers and similar industrial purposes the coal-tar pitch method is cheaper. The use of synthetic resins and waxes is economical only where savings in maintenance can be expected.

AMERICAN CHEMISTS DISCUSS VITAMINS

A joint meeting of the American Section of the Society of Chemical Industry with the American Institute of Chemical Engineers was held on March 27 at the Chemists' Club, New York City. The topic of the evening, "Vitamins," was discussed by Dr. Lela E. Booher and Mr. George Merck. Dr. Booher spoke on "The Chemistry and Nutrition of the Vitamins," while Mr. Merck, President of Merck and Co., Inc., gave a very interesting talk on "Synthetic Vitamins, a New American Industry." He pointed out that through fundamental research, each vitamin in its turn has been discovered as a nutritional factor, extracted from the natural food source, purified, and analysed and many have been synthesised. By the co-operation of industry with research, synthetic vitamins are now commercially available.

"TO BE SEEN IN AMERICA"

Some Refinements in Laboratory Planning and Furnishing

Notes Gathered by a Visitor

THAT much thought has been given to the making of laboratories in America is evident even from a casual inspection of industrial and academic laboratories which have been opened during recent years. In some cases the particular needs of the user have eclipsed other matters, apart from the purely structural aspect, but it is in the collection of single ideas that laboratory planning and furnishing is seen at its best. The ideal laboratory which serves all the needs of research, process development, and process control, in the present-day uses of chemical science, is never likely to be built.

At the Metcalf Research Laboratory at Brown University, Providence, R.I., the only permanent floor fixture in the research rooms is the sink. Benches, tables, and storage cabinets are all portable. Service pipes for gas, water, steam and air, and electric power, are carried on racks fixed to the wall by small brackets; a pipe for water drainage is hung in similar manner at a lower level. Thus there is nothing to hinder the moving of benches and tables, or the setting-up of special apparatus anywhere in the room. With the aim of providing a fireproof structure the interior walls are of vitrified tile; this made it necessary to provide means to carry pipes to the centre of the room and to suspend equipment. Ceiling inserts, 4 feet apart, starting at a distance of one foot from each wall, are therefore provided to enable special hangers to be fixed for the purpose needed. The exposure of the service pipes in the manner described makes for easy maintenance or alterations when desired; at McGilvrey Hall, part of Kent State University, Ohio, the same purpose is achieved by having pipes and electric conduit suspended about 2 feet below the ceilings in the rooms which they serve.

A centrally-located room for pulverising, screening, and similar mechanical operations using electric power, has been provided at Bagley Hall, in the University of Washington; here also is a special room where 144 Kjeldahl digestions can be carried on simultaneously. Distilled water is produced continuously at the rate of 10 gallons per hour, and delivered to an aluminium storage tank with a capacity of about 250 gallons, from which it is distributed throughout the building by aluminium piping; the valves on this are made of aluminium and have a silver seating. In the matter of benches and tables, preference has been shown for fir-wood frames with birch-wood tops; laboratory sinks are made of black enamelled cast-iron.

Fume-Removing Apparatus

At another academic laboratory, that of the University of Delaware, benches and tables were made of steel with soapstone tops; sinks, likewise, were of soapstone. Aluminium pipe was again used to distribute distilled water; for cold service water and hot water there was copper pipework, with cast bronze fittings. The laboratory floors had a special hard-finish asphalt surface, about one inch thick, applied over concrete; walls were constructed of hollow unglazed tile of a light buff colour. Particular attention has been given to ventilation and the removal of fumes, the latter being effected at both floor and ceiling level in order to deal with heavy as well as light vapour. In the main laboratory the fan removed 12,000 cu. ft. of air per minute, and the discharge duct passed to a lead-lined vent chimney. The ducts from the hoods were lined with 6 per cent. antimonial sheet lead. Drainage from sinks went through high-silicon cast-iron pipe of proved acid-resisting quality, but at ground level there was heavy acid-resisting clay-tile pipe to carry the drainage to a place of safe dispersal. The joints in the cast-iron pipe were made with asbestos gaskets and caulked lead; those in the clay-tile pipe had a bitumastic acid-resisting composition which was poured hot.

The American Medical Association has a micro-chemical laboratory at Chicago, where work can be carried on continuously regardless of outside weather conditions. The temperature of this room is controlled at 72° F. ± 0.5°; the relative humidity is set at 55 per cent. ± 1.5. For further efficiency, the floor, walls, and ceiling of the room are insulated by 4 in. of cork and 2 in. of cement, and the room is entered through a vestibule, to prevent any appreciable loss of conditioned air. The conditioned air is delivered through a series of holes in a duct along one side, near the ceiling. The air returns to the conditioning plant by a duct on the same side of the room, at floor level. This arrangement, having inlet and outlet on the same side of the room, causes most of the air to pass across the room as it enters and to re-cross at a lower level when it approaches the outlet. On the opposite side of the room, about 4 ft. above the floor, there is a small return duct which guides part of the air past the controlling instruments for the speedy rectification of any variation in condition.

Dealing with Illumination Problems

A decision to depend rather largely upon artificial light at the research laboratory of the Standard Oil Company of California, San Francisco, introduced the problem of removing the heat generated by the electric lights installed to give shadowless illumination. To allow the ventilating air to absorb this heat and at the same time provide for an even temperature in the rooms, it was decided that the expense of washing it would be justified. The rooms, which are grouped in pairs, have lead-covered benches along the boundary partitions and in the centre. The walls have fittings to allow large or small apparatus to be set-up without the need of special bases or stands. The ventilating system draws outside air through a water spray situated on the roof of the building, and this washed air is delivered to the laboratories at the rate of nearly 30,000 cu. ft. per minute; exhausted air is not recirculated. Each room has independent controls whereby the temperature can be regulated according to needs under conditions of accumulating heat from gas burners and the artificial lighting.

Fluorescent lighting is provided at the research laboratory of the Ethyl Gasoline Corporation, Detroit, but there are separate lamps for equipment which requires them. Here the floors have a smooth dust-free surface, provided by a special cement, with crushed quartz aggregate and chromic oxide for colouring, which is ground and polished. Where hoods are likely to deal with heavy concentrations of vapour, there is provision for draining any condensate. In its general structure the building allows easy extension and reorganised internal division. The individual rooms serving as laboratories have unglazed hollow tile partitions, which can be removed or built up without any interfering with service pipes. Equipment can be fixed to these partitions at any point. The service pipes are carried just below the flat steel roof of the building, and are exposed for easy access alongside the steel girders. As a novel feature, nitrogen being frequently in demand, the continual moving of cylinders from room to room has been avoided by piping low pressure nitrogen to the rooms where it is likely to be needed, a single storage vessel with reducing valve being provided as source of supply.

Air ducts, water pipes, and electric conduits are carried in the false ceilings of the corridors at the research building of the Hooker Electrochemical Co., Niagara Falls. Air conditioning is continuous throughout the year, and while indirect lighting is provided for the office parts of

the building, there is direct lighting in all laboratories. Tables, storage cabinets, and fume hoods are made of copper-bearing steel, lead-coated and finished with aluminium. In the analytical laboratory it was noticed that an electric refrigerator was provided for the storage of inflammable liquids, and was used also for general cooling purposes. The receptacles for waste are placed out of sight below the sinks, with access to them through an opening in the concealing metal panel. Part of the available working space below the hood has a permanently fixed steam bath. The bench along the outside wall of the room, with full effective length of window space, can be screened against strong light when necessary; part is 36 in. high, and part only 30 in. The lower height better meets the needs of titration work, as it allows the worker to sit comfortably on a laboratory chair. Analytical reagents are stored in 5-gallon bottles beneath this part of the bench, where they are protected from light-induced deterioration by the cupboard doors. Solutions are removed from the storage bottle by aid of compressed air, which forces them through glass tubes penetrating the bench.

Standard Space Units

Wherever possible, the research section of the General Foods Corporation at Hoboken, N.J., has adopted a standard laboratory space measuring 20 by 30 ft. Window space is practically continuous on outside walls. Floors are of maple-wood, laid over a 3-in. sub-floor carried by steel girders. Service pipework is concealed by false ceilings.

For flooring, the Commonwealth Color and Chemical Corporation, at Brooklyn, N.Y., have favoured an acid and alkali resisting asphalt tile. Tables and benches are made of steel, topped with a chemical-resistant artificial stone. Service pipes are hung from the ceiling in rooms on the floor below, and the connections are passed through the ceiling to the floor level of the room served. Fume hoods have their separate exhaust fans, and sufficient draught is provided to allow a noxious liquid to be boiled without the need of closing the hood. Buckets made of welded iron, heavily galvanised, are provided for waste. The provision of a trolley on each floor helps when moving quantities of material or apparatus from one room to another, or by way of the service lift to another floor. In connection with leather dyeing, a large steam-heated table is in use. This table has a steel frame with a copper steam-box and copper top; the exhaust hood above it is made of monel metal, and is hung from the ceiling girders by metal rods so that there is unobstructed access to the table on all sides. Another feature of interest is seen in the sample-weighing and delivering room, where tiered shelves are provided for the bottles, and there is a special and necessary hatch giving access to the main laboratory. This hatch has a circular turntable with a glass screen, and its purpose is to prevent air-borne dyestuff passing from the weighing room to the main laboratory, where it would contaminate the dyeings.

At the Armco Research Laboratories of the American Rolling Mills Co., Middletown, Ohio, distilled water is stored in a copper tank lined with block tin, and is distributed by tin-lined bronze piping; at the academic laboratories already mentioned, aluminium pipe was used. Hoods for fumes have both top and bottom draught, either or both of which can be in operation. The fumes are conveyed through asbestos cement ducts to a central point, where they are neutralised by passing through a caustic spray with baffles, thus effectively preventing the acid element from re-entering the air-conditioning system.

The pilot units of the Catalytic Development Co., at Marcus Hook, Pa., are housed in a building which has the unique feature of being partitioned to a height of 8 ft. only, out of the total available headroom of 21 ft. This building is so divided into six separate "cubicles," each measuring 35 ft. by 22 ft. and capable of housing two or three development units; there is a larger floor space, 50 ft. by 35 ft., at one end, with which a central corridor communicates. By this arrangement the whole of the floor space within the building can be served by an overhead travelling crane for installation or removal of equipment. The flat roof above the larger section of floor space has four removable panels, each about 5 ft. square, to allow very tall assemblies of plant when necessity arises. The doors of the building permit a truck to be backed in to deliver heavy equipment to the travelling crane which has 18 ft. of headroom and can reach any part of the floor space within the building. The pilot units operate at commercial cracking temperatures, with throughputs ranging from 1 to 20 gallons per hour. Equipment is heated electrically, 4000 amps at 110 volts being distributed by a copper bar system which can be tapped at any point. At one end of the building there is a hot room where drums of heavy oil can be kept at 150° F., while the rest of the building is not uncomfortably warm. The accumulation of hazardous vapours is avoided, and hot air rising to the roof is simultaneously removed, by fans at ceiling level and outlets to a duct at floor level. The vacuum system is a central one, operated by a steam jet, and is claimed to be as dependable as any other type of installation.

Bureau of Mines Laboratory

Fir-wood blocks, set end-grain up on a reinforced concrete floor coated with asphalt, have been adopted as flooring for the Bureau of Mines Experiment Station, at Bartlesville, Okla. Hoods are lined with enamel tile, and the top of the front opening is 6 ft. from the floor; each hood has a separate fan, which removes the air at the rate of 300 cu. ft. per minute. Pipe trenches run the full length of the floor-space, passing under each partition so that service pipes or tubes for special purposes can be run from one room to another as desired; there are also similar trenches running towards the centre of each room to serve apparatus erected away from the walls. Benches are made in standard interchangeable steel units, which are of cupboard, drawer, or open pattern. Adjustment bolts in the legs provide for small variations of height, and for unevenness in the floor surface. The steel is lead-coated and finished with acid and alkali resisting enamel; bench tops are made of "ebony asbestos." For general lighting on the indirect principle there is one 300-watt lamp to each 80 sq. ft. of ceiling area. As a safety measure to avoid injury when doors are opened without warning, they have upper panels of clear wire-protected plate glass. Another feature which might be more widely adopted is the installation of showers at every 20 ft. in the corridors, each operated by a pull chain hanging within each reach, and with a drain in the floor immediately below.

QUICK-DRYING OILS

An invention developed at the University of Minnesota may free the U.S.A. from its dependence on foreign purchases for its supply of tung oil, the most powerful drying oil known, widely used as a substitute for linseed oil. Oils derived from cotton, maize, ground-nuts, soya beans and linseed can be converted by the new process into oil of the desired qualities of tung oil. Untreated, these oils require some four days to dry into a film; after treatment by the new process they produce a clear, tough, glossy, non-wrinkling film in two days, a drying speed comparable with that of tung oil.

In these oils, in their normal state, the bonds joining the carbon atoms in the oil molecules are not conjugated. By conjugating the bonds the oils may be converted into quick-drying oils; and the more the atoms in the molecules are conjugated the faster the oil will dry. To conjugate the oils beyond their normal conditions, they are heated in the absence of water with an excess of alkali. In one example, linseed oil is made quick-drying by heating it with sodium ethylate in ethyl alcohol for about 6½ hours. The resultant product may be used in paints, varnishes, lacquers, and drying waxes.

ADVANCES IN INSTRUMENT DESIGN

Recent Progress in a Key Industry

THE man in the street seldom realises that before new types of tanks, guns, aeroplanes, or their component parts can be made, preliminary work must be done in the laboratories of research design, and that even when manufacture is in progress, essential control of the process must be maintained in the works control laboratories. The success of our war effort, in fact, stands or falls by the work carried on in our laboratories, and few industries, if any, have a better right to the denomination of "key industry" than the manufacture of laboratory equipment. Fortunately, we learnt our lesson in the last war, and although much laboratory equipment was imported in the period between the wars, we were not found wanting in this respect in 1939, as we were in 1914, and during the last 2½ years notable progress has been made by the firms responsible for the manufacture and design of laboratory equipment.

Not least among these is the old-established London firm of A. Gallenkamp & Co., Ltd., and a perusal of the 1942 Addenda List to their general catalogue is of high

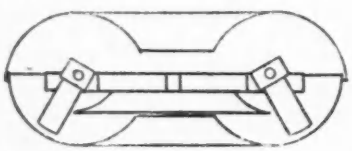


Fig. 1. High-speed centrifuge head for 8-5 ml. tubes

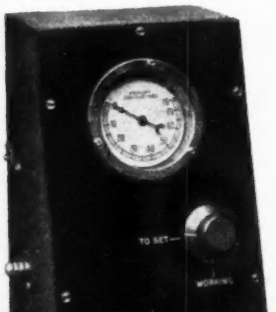
interest, not only to chemists but to scientists of all kinds, both theoretical and practical. A brief summary of some of the most important additions to their output is included here, and it is scarcely necessary to add that they will furnish any further information at their disposal.

The high-speed centrifuge head, illustrated in Fig. 1, is accurately machined from a solid forged steel blank and is heat-treated in course of manufacture. Special care and attention is given to the trunnion rings, which are machined from solid steel bar, and the permanently-set trunnion pins are of high-grade carbon steel. The head is enclosed in a metal streamlined jacket so that air friction is reduced to a minimum, as is also the load on the special high-speed motor, which will fit the standard base casting without alteration. Each head is given a continuous testing run of four hours before leaving the works.

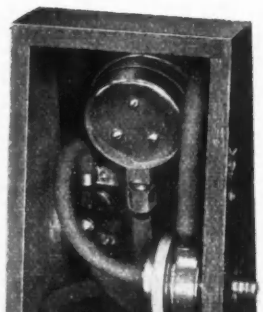
The disappearance of the humble Kipp's apparatus has come as a surprise to many chemists, but its absence has made room for improved gas generators. Notable among these is the "Technico" gas generator illustrated in Fig. 2. This incorporates Kipp's principle, but the design has been simplified and consists of one main part only, eliminating the often troublesome ground joints. Operation is easy, and an important point is that the relative capacities of the chambers are such that if the recommended amount of acid is not exceeded it cannot be blown out through the gas water seal if an excessive pressure of gas is generated in the reaction chamber. In practice it has been found that the following acid mixtures give the best results: with iron sulphide, for H_2S 1 water to 1 HCl; with marble, for CO_2 — 2 water to 1 HCl; with zinc, for H_2 — 2 water to 1 HCl.

It is held that the "Technico" Vacuum Regulator, shown in Fig. 3, fills a long-wanted laboratory need, and, so far as the makers are aware, this instrument is believed to be entirely original. Though designed originally for use with bacteriological filters where a constant steady vacuum was required, it clearly possesses a much wider range of application. It can be connected direct to any form of vacuum pump, and by a simple operation it can be adjusted so that the pressure in the apparatus to be evacuated is maintained at any value equal to or greater than that created by the pump. Then, as long as the pump continues to function, the output vacuum will remain constant.

All adjustments are effected by a single knob on the sloping front panel of the case. It is advisable to have a valve or stopcock between the pump and the regulator, as the instrument must be evacuated slowly. When the gauge indicates the desired pressure the knob is turned to the "working" position, and it will be found that the apparatus connected to the glass side tube will be evacuated to a steady pressure. It must, however, be remembered that the instrument is only a governor and cannot improve on the vacuum obtained by the pump

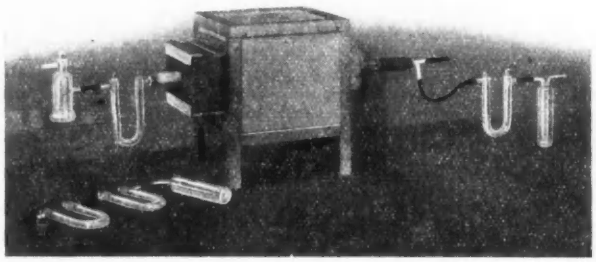


(a)



(b)

Fig. 2 (left). The "Technico" Gas Generator. Figs. 3a and 3b (above). The "Technico" Vacuum Regulator, showing (a) the exterior control panel and (b) the actual regulator inside the box, with methods of connection



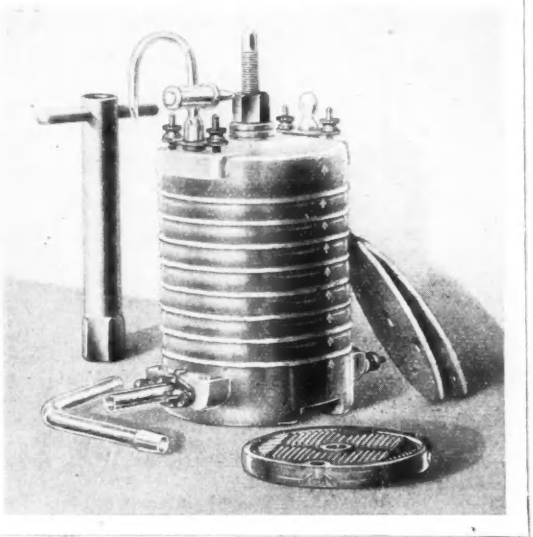


Fig. 4 (right). The "G.P." 14 all-glass laboratory filter press. Fig. 5 (above). Assembly of apparatus for the rapid simultaneous determination of carbon, hydrogen, sulphur, and chlorine in coal and coke. All blocks in this article are supplied by courtesy of Messrs. A. Gallenkamp & Co., Ltd.

(which is connected by the metal side tube). The ultimate pressure must also depend, of course, on the rate of leak into the system that is being evacuated.

The "G.P.14" all-glass laboratory filter press (Fig. 4), which is claimed to be the only filter of its type in the world, has been produced as the result of a wish expressed in many quarters for a filter which should eliminate all possibility of corrosion. It is designed for the filtration of chemical and other products, where the utmost cleanliness, sterility, and immunity from the attack of corrosive liquids and from metallic contamination was essential. In the whole instrument, the only parts that are not made of "Hysil" glass are the stainless steel clamping bolts, and these do not come into contact with the liquid being filtered. An extra convenience is that the condition of the liquid can be observed as it passes through the filter, while the vertical operating position permits of very complete draining at the end of a run. A transfer plate enables the lower portion of the filter to be used for clarifying purposes, and the upper for sterilising. The whole apparatus is specially toughened and proportioned to allow of sterilisation by steam or in an autoclave.

Describing the simultaneous determination apparatus illustrated in Fig. 5, Dr. R. A. Mott speaks of the method employed as "the most revolutionary advance in the analysis of coal which has ever been made." The method, in brief, consists in burning 0.5 g. of coal in a rapid stream of oxygen at a temperature of 1350° C. and absorbing the oxides of sulphur and chlorine in a spiral of silver gauze, the water in anhydrone, and the carbon dioxide in soda-asbestos. The silver sulphate is removed by solution in hot water and the silver chloride by solution in ammonia. Loss in weight of the silver after each treatment gives the amount of sulphate and chloride, and increases in weight of the anhydrone and soda-asbestos give the weights of water and carbon dioxide. This high-temperature combustion process applied to the simultaneous determination of carbon, hydrogen, sulphur, and chlorine reduces the total period necessary to 60 minutes. One combustion takes only 10 minutes and the method can be used for the determination of carbon and hydrogen in about 20 minutes. Thus the time factor for determining carbon, hydrogen, sulphur, and chlorine is reduced to so short a period, and the simplicity and handiness of the apparatus are such that the claim voiced by Dr. Mott is seen to be in no way an exaggeration.

Centrifuge for Diamond Dust

German Patent Inspired by Shortage

A SIDELIGHT on the shortage of commercial diamonds in Germany is offered by the German patent specification D.R.P. 668,186, which describes a new centrifuge for the separation of diamond powder. In itself, the process has some chemical engineering interest; its immediate intention is the speeding up of commercial production of diamond powder.

According to the *VDI Zeitschrift*, reported in *Chem. Met. Eng.*, the ground diamond powder to be separated is put into a viscous fluid such as oil or glycerine or into a salt solution. Previously when diamonds were pulverised they were allowed to precipitate in olive oil, but the finest grains had to stand in the oil for a whole year, and the diamond granules varied greatly in size. The new process calls for a "mud" solution containing as much as 20 to 30 per cent. of diamond dust. This is placed in the beaker of the centrifuge, and different sized grains are centrifuged out at different speeds, thereby making it possible to separate various uniform sizes of grains. It is claimed that the process can be used equally successfully with granular boron carbide, silicon carbide, corundum, and quartz.

Light-Fastness Standard

The Result of 15 Years' Research

RESEARCH on the production of standards for determining the fastness of coloured textile materials was initiated by the Society of Dyers and Colourists in 1927, and resulted in the selection of two parallel series of dyed standards. These two series, a blue and a red, each comprised seven dyeings of increasing degree of fastness, the increase being in geometrical progression. Comments were invited on these standards and contact was established with the Fastness Committee of the American Society of Chemists and Colorists and with the Society of German Chemists. Results were compared and discussion initiated with a view to the adoption internationally of a common range of standards. At the same time the Society's Fastness Committee carried out further research as certain of the standards were known not to be completely satisfactory.

Although it was not found possible to reach complete agreement on all the standards, considerable progress was made and a blue series (eight dyeings in all) was submitted to the British Standards Institution for publication. The result is B.S. 1006 (Part I), just published by the Institution at 2s. 3d. post free.

A Year's Intensive Production

How Laboratory Furnishers have met Heavy Demands

THE heavy demands of Government Departments and the laboratories of works on munitions production have necessitated further expansion of the Widnes factory of J. W. TOWERS AND CO., LTD., during the past year. All types of scientific lamp-blown and graduated glassware are made, as well as a large range of scientific apparatus, including electric ovens and furnaces for which there has been a big demand. Their new factory at Hough Green, near Widnes, for the production of Towers Streamline Hydrometers, has shown a record output, all types including I.P.T., S.T.P.T.C. and B.S.S. being made.

The "Dreadnought" glass pipe-lines with the Towers patent ebonite tube connector are extensively used in chemical plants for conveying corrosive liquids, being found to have many advantages over metal or stoneware pipe-lines. They are completely resistant to corrosion both internally and externally, and are made up to 2 in. bore. Towers pure acids and Towers Tested Analytical Reagents are also in increased demand.

A new production of special interest is the Towers "Model 75" analytical balance (Fig. 1). It is an entirely new balance, of first class finish and adjustment, and is

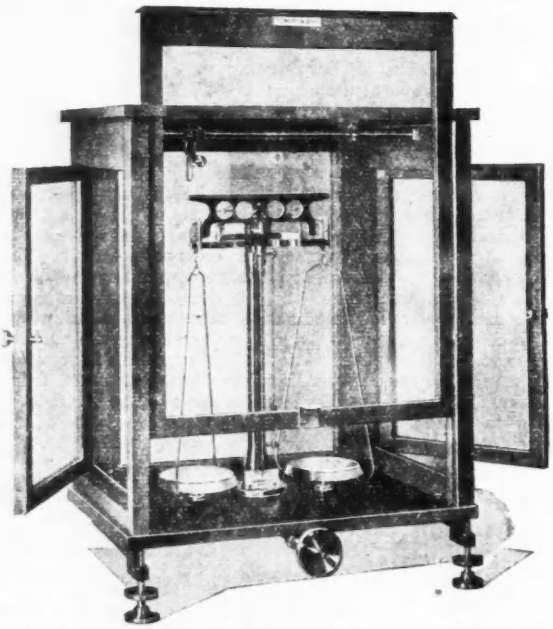


Fig. 1. "Model 75" analytical balance made by J. W. Towers & Co., Ltd. It combines smooth action with robustness and replaces types formerly imported from the Continent

fitted with a new type of double arrestment which places the load on the outer knife-edges before the beam is released, thus achieving an exceptionally smooth action and maintaining the sensitivity over a long life. This balance is at present being made in limited numbers at the Widnes workshops. In order to increase output a new factory solely for the manufacture of balances is now in course of construction, also at Hough Green.

Small-Scale Equipment

L. A. MITCHELL, LIMITED, Manchester, make a number of small plant units specially for small-scale manufacture, experimental and research work and particularly for use in the chemical and allied industries.

These comprise small laboratory stirrers with either 1/60th h.p. motor or $\frac{1}{8}$th h.p. motor, arranged with a speed controller in the base of the unit for giving wide variation in the speed of agitation. These mixers are all complete with stainless steel shaft and propellor, mounted on chromium-plated column and metal base. With the 1/60th h.p. mixer, the motor is provided with a three-speed cone pulley so that it can be used as an independent driving unit in the laboratory.

Their drying cabinets for semi-works-scale production or experimental work are self-contained units arranged for steam or electric heating, the temperatures being thermostatically controlled. For giving rapid, economical drying of materials that can be handled on trays, these drying cabinets are extremely useful, and they have a neat attractive appearance. Being portable in construction, they can be readily transferred to different points in the works or research dept. In addition to the above, drying cabinets are provided specially designed for handling textile materials, fitted with poles inside to take samples, dye-house testings, hanks, etc. Small film or steam-drum dryers of the atmospheric and vacuum types, arranged with double drums, are suitable for drying liquids, slurries, solutions, etc., direct to a finished dry powder or flake without prior filtering. When desired, the machines are arranged for insertion inside a vacuum casing for drying under vacuum.

"Vitreon" ware is a white, non-porous body, free from iron and of high tensile and mechanical strength, and it is suitable for all acids (except hydrofluoric), alkalis, corrosive liquors, etc. It can be supplied glazed or unglazed according to requirements, and a number of examples are illustrated herewith (Figs. 3, 4, 5). L. A. Mitcheli, Limited, are the sole selling agents.

Electric Furnaces and Platinum Electrodes

JOHNSON MATTHEY AND CO., LTD., 73-83 Hatton Garden, London, E.C.1, have long been suppliers of precious metal filaments for the winding of electric muffles, and their very considerable experience has now been applied in the manufacture of their own platinum wound electric furnaces for laboratory use. That there existed need for reliable and efficient laboratory furnaces of this type has been amply demonstrated by the widespread interest which has been aroused by news of their availability, particularly for such uses as the determination of carbon and sulphur in steels. Their neat and workmanlike appearance in the laboratory is well seen in the accompanying illustration (Fig. 7).

New methods of construction and the use of specially prepared metal have enabled the same firm to offer a series of new platinum electrodes of outstanding interest. Not only are these new electrodes considerably stronger than those previously offered, but the methods of construction and special hard platinum employed have permitted an actual saving in total weight, and consequently a reduction in price.

Laboratory Porcelain

As far as laboratory porcelain is concerned, the outbreak of war in 1939 found us in an incomparably better position than in 1914. Before the last war this country was entirely dependent on continental (mainly German) supplies of crucibles, funnels, evaporating basins, combustion boats, and all the other essential items of porcelain equipment for research work. It soon became apparent that existing stocks would last but a few months, and two well-known English potteries set to work, with the help and advice of chemists and leading laboratory-furnishing firms, to produce laboratory porcelain in Great Britain. After a short period of intense research, a grade of ware was produced which compared very favourably with the German product, itself the result of long years of experience.

Since those days further progress has been made in improving the mechanical strength of laboratory porcelain; particularly its resistance to high temperatures and thermal shock; and also its resistance to acids and other aggressive

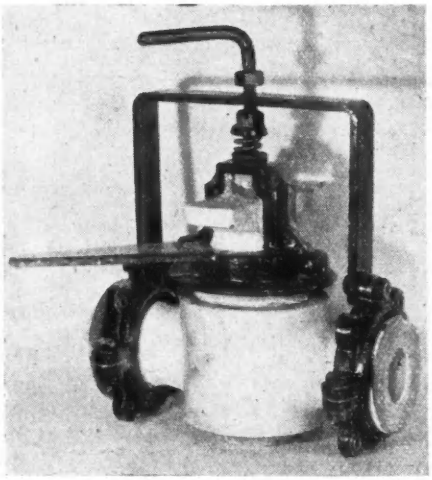
NEW DEVELOPMENTS IN LABORATORY FURNISHING

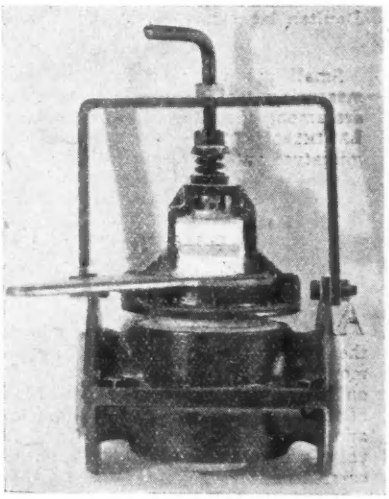
(see article opposite)

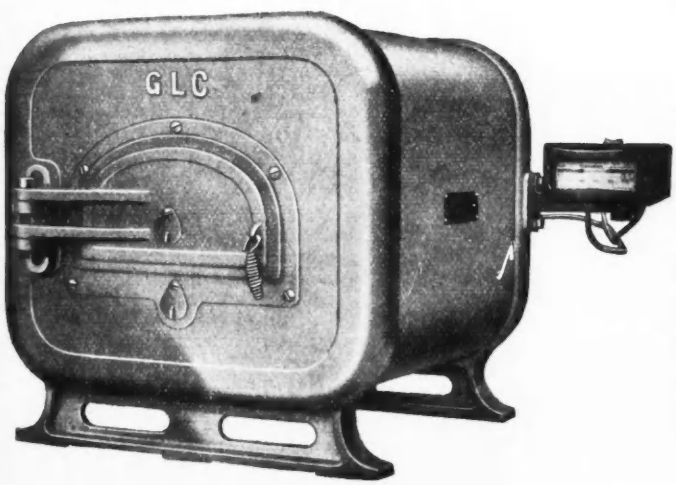
Top row: Fig. 2. Selection of laboratory porcelain made by Doulton & Co., Ltd.

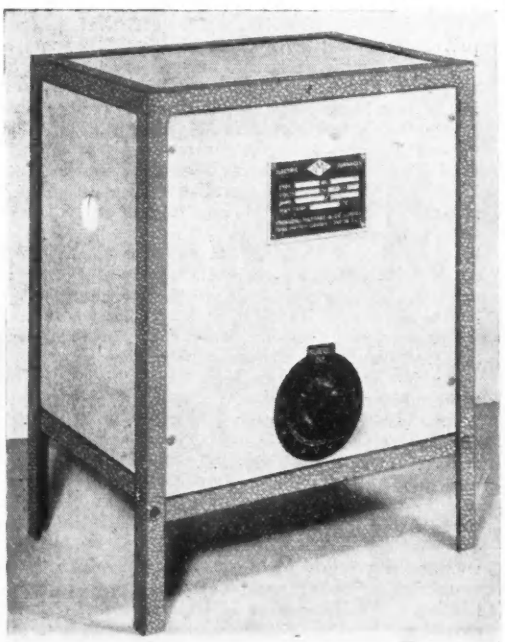
Centre row (left to right): Fig. 3. Covered "Vitreon" ware vessel for fine-chemical manufacture.
Figs. 4 and 5. Acid-proof cocks in "Vitreon" ware, fitted with special device to prevent the plug from sticking. Fig. 5 has cast-iron armouring, and is specially useful for handling hot acids.

Bottom row (left to right): Figs. 6 and 6a (above). Miniature pyrometer outfit, by Elliot Brothers (London) Ltd., with pyrometer stem above.
Fig. 7. J.M.C. electric furnace, by Johnson, Matthey & Co., Ltd., with "Sunvic" control and finished in enamel.









chemicals. The manufacture of laboratory porcelain is perhaps the smallest section of the pottery industries' activities, but the matter is of the utmost importance in all kinds of research connected with the war effort. To meet the greatly increased demands of the past 2½ years, new plant and additional kilns have been installed in the potteries, and it is interesting to know that apart from the actual firing of the ware, all the processes are carried out by women operatives.

For obvious reasons, details of apparatus recently designed for special purposes cannot be given at present. Among other developments of more general interest to all chemists are the following: porous-bottomed crucibles similar to those formerly made by the Berlin State Porcelain Works are now available in Royal Worcester porcelain. Buchner funnels of a heavier type than the usual porcelain funnels are being made by the ROYAL DOULTON POTTERIES. These have been designed to overcome difficulties which sometimes arise from breakdowns under vacuum when ordinary funnels are employed. The new Buchner funnels are made from a special heat-resisting chemical stoneware body which may best be described as a "porcellaneous stoneware." A group of some recent Doulton laboratory products is illustrated in Fig. 2.

Miniature Pyrometers

Small pyrometer outfits, complete with indicators, for measuring temperatures up to a maximum of 1400° C. are among the latest equipment manufactured by ELLIOTT BROTHERS (LONDON), LTD., Century Works, S.E.13. These miniature outfits are particularly applicable at the present time, in connection with many kinds of muffled furnaces, high-speed steel furnaces, and for the heat-treatment of tools. Each outfit consists of a miniature temperature indicator of the horizontal edgewise type, with a scale 3½ inches long, and an anti-parallel mirror, together with the appropriate pyrometer stem and leads, according to the maximum temperature measurement required. Any type of pyrometer stem may be used with this indicator and various types of stem have been designed to suit individual purposes. The sensitivity of the miniature temperature indicator, when used with platinum/platinum-rhodium thermocouples, is about 8.5 ohms per millivolt, and about 2.2 ohms when used with base-metal couples. It has a ⅜-inch socket and a clamp for mounting adjacent to or on the furnace, on a heat-insulated pin.

The outfit for temperatures up to 1100° C. ("G.L.C." Type A Furnaces) consists of an indicator calibrated 0-1000° C. or 0-1100° C. as desired; and a pyrometer stem of a base-metal ("Alchro") thermocouple, insulated and enclosed in a refractory sheath ⅜ inch O.D., with a metal fixing collar, while the leads are extensions of the thermocouple wires themselves without any joint, insulated with porcelain beads. For temperatures up to 1400° C., the outfit consists of an indicator, a platinum/platinum-rhodium thermocouple stem, insulated as before, an ebonite terminal plate, and the leads, which are of twin-braided compensating cable. In either case, the length of the stem under the collar does not normally exceed 12 inches, and the length of the beaded leads is not supplied longer than 36 inches.

Laboratory Design

Industrial Chemists' Discussion

AT the eighth meeting of the session of the Society of Chemical Industry (London Section) in the rooms of the Chemical Society at Burlington House, earlier this month, Dr. A. J. V. Underwood presided over a discussion on laboratory design. The speeches were short and most of the speakers used lantern slides to illustrate their ideas and experiences, which were found to vary very considerably according to the type of research that was being carried on.

Mr. J. McKillop described an I.C.I. laboratory in the North, concerned with dyestuffs research. Their problem was to house 82 chemists and 82 assistants in more or less private laboratories in one building. Over twelve months were spent with architects designing the plans for the fitting in of all the supply points. Then a three-storey building, with a large glass surface, was evolved. Each floor had seven modern laboratories. Lighting, air-conditioning, ventilation and fume cupboards were all fitted into the final plan with great success and economy. As far as he could see, in modern laboratory design the one-time large laboratory had to give way increasingly to the small specialised laboratory. Or rather, the large building had to be designed so as to be capable of division into the smaller laboratories. In early stages of design they could not spend too much time in finding out just what the laboratory would be used for, and it must be built specially for that use. There must be active collaboration between architect, research worker, and engineer.

Mr. W. E. Prytherch dealt with a metallurgical laboratory concerned mainly with mechanical testers, and accommodating 70 research workers in each unit. The division of work developed into testing, investigation, and real research. Much attention had to be given to walls and floors. The laboratory was a single-storey building and the roof was used for outside work, to save the occupation of extra ground. Easy access to all roads was essential because of the heavy materials dealt with. There was one big central store and all material was dealt with from that point. It was found important to house a good library and all supplies had to be separate in source, so that if the factory broke down the research laboratory could continue to function. Lighting fixtures were all made of aluminium so as to eliminate corrosion problems.

Mr. P. L. Bilham first described a food-research laboratory as it was 15 years ago, and then outlined the big changes that had had to be made to keep all departments up to date in the analysis of such varying products as bread, jam, tea, coffee and ice cream. They had a very large section for food samples, and found that a large laboratory was better in practice than a group of small ones.

Magnesium Metal in Wounds

Danger of Gangrene

METALLIC magnesium and some of its alloys have been found to produce a unique gaseous condition when they get into wounds. Unless the magnesium is properly and completely cleaned out of the wound, even trivial injuries may become serious and prolonged. The condition that results is similar to gas gangrene, a serious war-wound danger, except that it is caused by the magnesium instead of by germs. According to reports received, this kind of chemical gas gangrene has been very prevalent in German industries, with as many as 5000 cases in 1939.

Studies by Dr. C. P. McCord, Dr. S. F. Meek, and Dr. G. C. Harrold, all of the Chrysler Corporation, are reported in a recent issue of *Chemical Safety*. "Early in our investigation," Dr. McCord states "we found that rat wounds in which small particles of magnesium had been introduced, unlike those contaminated with most metals, glass, or wood, promptly led to hydrogen gas formation in the tissues. The quantity of gas we found to be extensive and if neglected would probably produce a condition akin to gas gangrene. In the presence of magnesium particles it was discovered that hydrogen was evolved from the fluids of the tissues themselves and, if the metal was not immediately extracted, would form a gaseous tumour. The danger of this effect of magnesium calls, in the first place, for special preventive procedure against accidental injuries where magnesium particles might be involved, and in the second place, the availability of immediate proper medical care."

X-Rays and Industrial Chemistry

Diffraction as a Solution for Chemical Problems

THE conference on X-ray Analysis in Industry, which was held at Cambridge earlier this month under the auspices of the Institute of Physics and sponsored by Sir Lawrence Bragg as president, was arranged with the objective of pooling the technical knowledge obtained to date by various groups of research workers operating in isolated laboratories in various parts of the country. Sir Lawrence Bragg delivered an enthralling discourse on "The History and Development of X-Ray Analysis" a subject in which he and his father, Sir William Bragg, were pioneers. The general programme was extremely varied, and there can be no doubt that the interchange of information thereby obtained will lead to a great lessening of duplication of work, as well as to a direct accession of technical knowledge generally in the department of X-ray analysis. Some interesting photographs and apparatus demonstrating recent developments were exhibited in the Cavendish Laboratory by members attending the conference.

Bleaching Powder Constituents

Of the many papers and discussions which formed the chief part of the programme, it is probable that the contribution of Mr. C. W. Bunn, of the I.C.I. Research Department, Northwich, will be found to be of most direct interest to the average industrial chemist. He chose as his title, in fact, "Some Applications of X-Ray Diffraction Methods to Industrial Chemistry," and outlined the methods by which, using X-ray diffraction patterns, he had been able to solve certain problems of industrial chemistry.

The results obtained include the identification of the constituents of bleaching powder, the behaviour of which was not altogether satisfied by the usual explanation of the reaction of its formation as: $2Ca(OH)_2 + 2Cl_2 \rightarrow Ca(OCl)_2 + CaCl_2 + 2H_2O$. After all other methods had failed it was found, by the X-ray diffraction method, that commercial bleaching powder consists simply of a mixture of the basic chloride $CaCl_2.Ca(OH)_2.H_2O$ with a variable hypochlorite phase. The difficulty of further chlorination, and the fact that the mixture is not markedly deliquescent, are accounted for by the presence of the basic chloride formulated above, which appears to be a very stable substance.

Identifying Boiler Scales

Another stubborn chemical problem is the identification of boiler-scale constituents. X-ray powder photographs have been found successful in placing several calcium silicate scales from various sources as essentially the same as certain known minerals. Some sodium aluminosilicate scales have also been investigated, with equal success; phosphate scales have been found to be usually apatite. In another direction, plaster of paris has been identified correctly, not as the hemihydrate of calcium sulphate ($CaSO_4.\frac{1}{2}H_2O$), but rather as a subhydrate ($CaSO_4.nH_2O$), where n may vary between 0 and $\frac{3}{4}$. It is when the absorption of water in the crystals occurs up to the maximum of $\frac{3}{4}$ that the saturated crystals dissolve and the plaster of paris "sets" to form gypsum.

Further details, both of Mr. Bunn's paper and of the papers delivered at the conference generally, have already been published in the *Journal of Scientific Instruments* (1941, *18*, 5 and 7).

New Hard Glass

American Progress in Laboratory Ware

REPORT of a new hard glass for laboratory use, made in the Laboratory and Pharmaceutical Division of the Corning Glass Works, Corning, N.Y., U.S.A., is contained in a recent issue of the *Journal of Scientific Instruments* of the Institute of Physics.

This glassware is made from "Pyrex Vycor" 96 per cent. silica glass No. 790. Manufacturing methods necessary in its production depart radically from conventional glass practice. A special glass of apparently normal characteristics is treated by a new and unique process in which practically all the constituents other than silica are removed by leaching in hot chemical solutions. Considerable time is required for this treatment, although it varies with the form and type of ware. The silica residue, after being washed, dried slowly and finally fired at carefully controlled high temperatures, becomes a transparent vitreous glass of simple chemical composition. Exceptional chemical stability, high softening point, and very low thermal expansion are outstanding properties. Certain limitations are necessarily imposed in the manufacture of this glassware. Special oversize moulds are required to allow for shrinkage in the leaching and firing processes. There are also restrictions in the matter of size, shape, and wall thickness. Dimensional tolerances required are in general greater than those common to usual glass practice.

Silica constitutes approximately 96 per cent. of this glass; the remainder is chiefly boric oxide with traces of aluminium, sodium, iron, and arsenic.

The makers point out that the following representative figures are given as a guide; the stability of glass is influenced by many variables and the only safe way to compare glasses is to test them simultaneously.

	"Pyrex Vycor" No. 790	"Pyrex" brand No. 774
Loss in weight, 100 lb. wet steam pressure for 96 hr.	0.0001 g./sq. cm.	0.0005 g./sq. cm.
Loss in weight, boiling 6 hr. in 5 per cent. caustic soda	0.0015 g./sq. cm.	0.002 g./sq. cm.
Loss in weight, boiling hydrochloric acid	Negligible	0.000002 g./sq. cm.

Other data given by the manufacturers for this glass are:

	No. 790	No. 774
Softening point	Approx. 1500° C.	820° C.
Linear coefficient of expansion per ° C.	0.0000008	0.0000032
Specific gravity	2.18	2.23
Refractive index	1.458	1.474

The tensile strength both in intrinsic value and under actual service conditions is stated to be practically the same.

The maximum temperature limits of glass depend greatly on the conditions of use. In general 900-1000° C. should be considered the upper service limit. For certain specific uses, and for limited periods, higher temperatures may be used; however, the limitations at higher temperatures should be recognised. At 1000° C. devitrification as well as a tendency towards softening become limiting factors. Repeated heating (over blast lamp) and cooling shows that weight change is negligible.

It is understood that at present only a limited range of laboratory ware is being manufactured from this glass, but that additions will to some extent be governed by the demand.

Personal Notes

MR. F. G. CLAVERING FISON, who has been appointed Sheriff for the County of Suffolk for 1942, is chairman of Messrs. Fison, Packard and Prentice, Ltd., Ipswich.

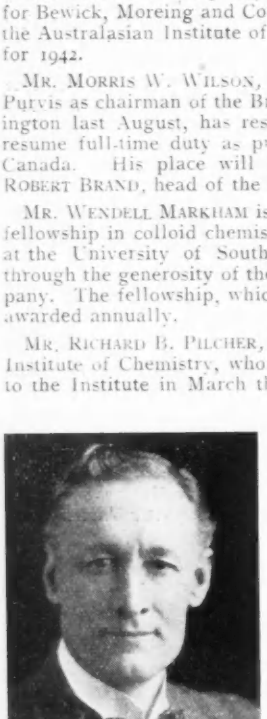
MR. C. A. F. HASTILOW, F.I.C., is joining the Miscellaneous Chemicals Control, Terminal House, 52 Grosvenor Gardens, London, S.W.1, to be in charge of a section dealing with raw materials required by the paint industry.

MR. VICTOR T. EDQUIST, general manager in Australia for Bewick, Moreing and Co., has been elected president of the Australasian Institute of Mining and Metallurgy (Inc.) for 1942.

MR. MORRIS W. WILSON, who succeeded the late Arthur Purvis as chairman of the British Supply Council at Washington last August, has resigned his position in order to resume full-time duty as president of the Royal Bank of Canada. His place will be taken temporarily by MR. ROBERT BRAND, head of the British Food Mission.

MR. WENDELL MARKHAM is the first holder of the research fellowship in colloid chemistry which has been established at the University of Southern California, Los Angeles, through the generosity of the Colgate-Palmolive-Peet Company. The fellowship, which carries a stipend of $1000, is awarded annually.

MR. RICHARD B. PILCHER, Registrar and Secretary of the Institute of Chemistry, who completed 50 years' of service to the Institute in March this year, is to be the recipient of a presentation on this auspicious occasion, at the suggestion of the President, of past and present officers and members of Council and of Local Section Committees. The nature of the presentation has not yet been disclosed, but (announces the *Journal* of the Institute) the Staff of the Institute has already presented "the Chief" with an umbrella. The genial Registrar is known and esteemed by a circle of chemists even wider than the 8000 Fellows, etc., of the Institute, and all his friends in the chemical world will be delighted to take this opportunity of offering him their congratulations as well as their thanks for his half-century of work on behalf of British Chemistry.



Mr. R. B. Pilcher

Obituary

PROFESSOR JEAN PERRIN, who died recently in New York, aged 71, having succeeded in escaping from France to the U.S.A., was Professor of Chemistry and Physics in the Paris Faculty of Science. He won a Nobel Prize in 1926 for his discoveries in connection with the discontinuous structure of matter, and was noted for his studies on the properties of radium and the problems of fluorescence.

Chemical Matters in Parliament

Anti-Fouling Paints

IN the House of Commons last week, Sir John Graham Kerr asked the First Lord of the Admiralty (1) in view of the fact that the fouling of ships by marine growths reduced speed and increased fuel consumption, whether the Admiralty had employed any biologists during the years 1939 to 1942, to investigate means of diminishing this evil; and if so, whether the Contracts Department of the Admiralty had been guided by their investigations when placing orders for anti-fouling paints, and (2) whether he was aware that British manufacturers, employing chemists and biologists to study the effectiveness of anti-corrosive and anti-fouling paints, had accumulated much important chemical knowledge of the subject.

In reply, the Civil Lord of the Admiralty stated that the Admiralty did not directly employ biologists to investigate the fouling of ships, but their technical experts co-operated actively with a special Sub-Committee of the Corrosion Committee of the Iron and Steel Institute, which employed full-time investigators into the marine-biological and corrosion aspects of the problem, and had the part-time assistance of a number of biologists, chemists, and metallurgists. Their investigations were not yet by themselves sufficiently conclusive to be used as a guide for placing contracts, and purchases of proprietary compositions were made as a result of periodical competitive trials. He knew that information had been accumulated by British manufacturers and the Association of Ships' Compositions Manufacturers had been invited to co-operate in the work of the Sub-Committee of the Corrosion Committee, but up to the present had not done so.

Sir Irving Albery then asked whether that meant that full and adequate steps to prevent corrosion of H.M. ships were still not taken, or that they had not been perfected. Captain Pilkington stated that this was not so, and the Admiralty experts were co-operating actively with a special sub-committee who were engaged on this work. Sir Percy Harris asked whether the Minister did not think it time the Admiralty made more direct use of the great scientific knowledge available, and employed scientific experts on important work of this kind, to which Captain Pilkington replied that co-operation had been asked for, and in most cases was forthcoming.

New Control Orders

Heavy Chemicals

UNDER the Export of Goods (Control) (No. 19) Order (S.R. and O. 1942, No. 711) made by the Board of Trade, which came into force on April 21, the control in respect of certain heavy chemicals is withdrawn and, apart from certain destinations to which the exportation of all goods is prohibited, no licences will, in future, be required to export chalk, whether ground or not, including whitening; caustic soda; cement, calcareous, ground and unground; salt; sodium bicarbonate; sodium carbonate; sodium silicate; and sodium sulphate.

Licences to Import Buchu Leaves

The Import Licensing Department of the Board of Trade is now prepared to consider applications for the importation of buchu leaves from South Africa. Licences will be granted on the basis of the value of the importer's imports of these goods from South Africa during the year ended August 31, 1939. Applications for forms should be addressed to the Import Licensing Department, 1-6 Tavistock Square, London, W.C.1.

TIN SOLDERS

The need for economy in tin makes it necessary to consider where and how the composition of tin solders can be modified, and changes of this kind must be based on a sound knowledge of existing tin solders and their properties. It is, therefore, of interest that the British Non-Ferrous Metals Research Association is issuing a second edition of its monograph, *Tin Solders*. The first edition, by Mr. S. J. Nightingale, has been thoroughly revised by Dr. O. F. Hudson and brought up to date in the light of investigations carried out in the last ten years. Important new sections have been added on the creep properties of solders and soldered joints, and the new edition, which will be published immediately, is a book of 118 pp., price 10s. 6d. post free (U.S. $2.75 post free). It may be obtained from the B.N.F.M.R.A., Euston Street, London, N.W.1, or from any bookseller.

Controlling Soil Reaction

A Universally Important Task for *p*H Meters

by H. SEYMOUR

FEW of the important properties of soil can be quickly and accurately measured, but its reaction is one of them, fortunately. Whether a soil is neutral, acid, or alkaline, and the degree of its acidity or alkalinity has long been known to be one of the controlling factors in plant growth, but only since *p*H measurements have been applied to soils has it been possible to express this relationship in precise terms.

The soil is a marvellously complex medium, in which innumerable physical and chemical reactions take place and which, under the eye of the high-powered microscope, appears alive with bacteria, fungi, and other organisms. Since physical conditions, chemical changes, and life of all kinds are known to be greatly affected by the reaction of the surrounding medium, it is evident that the reaction of a soil must have a profound influence on the plants.

Ideal conditions for plant growth are attained only when the physical condition of the soil is properly regulated, when the chemical reactions are properly controlled, and when bacterial activity of the right kind takes place. By a proper regulation of physical condition is meant that the colloidal matter of soils is kept largely in a flocculated condition, in order that heavy soils may be kept open and porous, thus allowing a ready entrance of air and water, and the removal of excess water by under-drainage. The close connection between reaction and physical condition of colloids is well known and has a direct application to soils, for soils consist to a considerable extent of colloidal material. It is in fact the colloidal material that exercises a controlling influence on the character of most soils.

The Ideal Reaction

The most favourable physical condition of a soil is usually obtained when the reaction of the soil lies in the range of *p*H 6.0 to 8.0. In dry regions alkalis may accumulate until the *p*H is as high as 9.8 or 10.0, owing to the presence of sodium carbonate. Alkalinity indicated by a *p*H above 8.0 adversely affects the growth of many plants. High alkalinity causes a deflocculation of the soil, that is, the soil granules break down and the particles run together, forming a hard compact soil with too little pore space. On the other hand, if the soil is more acid than *p*H 6.0, it also tends to deflocculate, although not to the same extent as under too alkaline conditions. It is true, none the less, that some plants grow best in a soil which has a *p*H value below 6.0. For example, strawberries and ericaceous shrubs thrive on a soil with a *p*H of 4.0. Some northern soils, in their natural forested condition, may be as acid as *p*H 3.5. Cultivated soils rarely show an acidity stronger than *p*H 4.0.

Because of the great variation in the reaction of soils and because of the profound influence of this reaction on fertility, it is highly desirable for all soils to be tested and their reaction determined in order that the necessary corrections can be applied. The *p*H value, either directly or indirectly, indicates whether or not the most common agricultural crops and many other plants can make normal growth, regardless of other favourable conditions. To make these tests is an exceedingly simple matter. They can be done by anyone of average intelligence with the aid of field sets of hydrogen ion measuring equipment. Such sets are not expensive, and they are simple and rapid in use. Moreover, they are infallible.

The soil, if acid beyond the best range of the crop to be grown, must be limed in sufficient quantity to produce a favourable *p*H reading. This does not mean liming to neutrality if the crop does not require a neutral reaction. In general the use of lime on acid clay soils in time greatly improves their physical condition, thus facilitating their workability and aeration. On acid sandy soils, the use of lime helps to bind the particles together and thus decreases the too great looseness. Excessively alkaline conditions can be corrected by applications of gypsum or sulphur, accompanied by adequate drainage to remove the reaction products thus formed. Soils only slightly unfavourable on the alkaline side for the growth of a crop can be made gradually more acid by the use of fertilisers which produce an acid effect, such as sulphate of ammonia.

The availability of phosphorus, an essential element for all plant growth, is greatly influenced by the soil reaction. If the soil becomes too acid, the phosphorus often decreases in availability to a point where the plant suffers for the lack of it. In fact, most of the essential elements which the plant obtains from the soil are kept in a more available condition when the acidity is not allowed to become much greater than *p*H 6.0. The nitrogen-fixing bacteria that live in the nodules on the roots of our most valuable legumes cannot live long or function properly in a soil that has become strongly acid. Under these conditions the nitrogen supply of the soil cannot be replenished except at great cost through the use of nitrogenous fertilisers. In fact, nearly all desirable bacterial processes in the soil proceed more favourably at *p*H 6.0 to 8.0 than at more acid or alkaline conditions. The relation of soil-borne plant diseases to soil reaction is an important one. The organism causing potato scab, for instance, can be controlled much better if the soil is kept slightly acid.

Soils vary greatly in reaction from field to field and even in different parts of the same field. The popular conception that only low, moist soils are acid is erroneous. This conception probably arose because acidity of soils was first recognised in peat or marsh soils. During the past thirty years it has been found that many high soils of a mineral nature are acid and that the higher parts of a field are usually more acid than the lower. Nearly all soils in regions having an annual rainfall of 25 in. or more tend to become acid. The reason for this is that the basic material of the soil is much more soluble than the acidic and hence is leached out, leaving an excess of acidic material. And as the basic material is removed from the high places and deposited at lower levels it is easy to understand why the higher places become acid first. It is for this reason that peat marshes surrounded by upland soil well supplied with lime are not acid. Under the reverse conditions the peat marshes may become very acid due to the formation of organic acids which are not neutralised. If the precipitation is very low the tendency is towards the accumulation of soluble salts, especially sodium carbonate, and this gives rise to alkaline soils.

Alcohol and Sugar from Wood

Results of Finnish Experiments

THE Oulu Works in Finland, which received a Government grant of 3,000,000 Fmk. for experiments on the saccharification of wood, have been engaged on research work since January last. Wood and wood waste, especially from coniferous trees, were treated in an experimental plant, and it was found that fermentation yielded about 60 litres of alcohol per cubic metre of wood pulp. The by-product lignin is to be used for the manufacture of synthetic resins for which a new company was formed recently. There is a big demand for wood-sugar for cattle feed from Finnish farmers and there would also be an extensive market for alcohol, but economic investigation showed that a plant capable of an annual output of 10 million litres would now cost 80,000,000 Fmk. to build, which is twice as much as two or three years ago. In the circumstances it is considered unlikely that any private firm will make use of the process unless the Government agrees to grant substantial subsidies for the erection of a plant.

Weekly Prices of British Chemical Products

STRONG price conditions continue to be the chief feature of the industrial chemicals market, and a fair amount of new business has been reported. In most sections, however, there has been very little material on offer, since available supplies are mostly absorbed by deliveries under existing contracts. There is a steady demand for acetic acid, hydrochloric acid, and boric acid, while supplies of oxalic, tartaric, and citric acids are insufficient to meet current requirements. No change of any importance falls to be recorded in the potash section, where the supply position remains the chief consideration. Firm conditions prevail throughout the soda products section, with chlorate of soda in persistent demand. The range of quotations for the lead oxides continues unchanged. Conditions in certain sections of the coal tar products market are reported to be a little uncertain, and quotations for such items as xylol, solvent naphtha, and the pyridines appear to have a less steady undertone. There is a good call for carbolic acid and for creosote oil, while a sustained interest is maintained in the cresylic acid market.

MANCHESTER.—Steady contract deliveries of most of the leading classes of heavy chemical products have been a feature of the Manchester market during the past week, though some makers have a substantial accumulation of orders on their books. So far as new inquiry is concerned, moderate interest has been displayed by the textile and allied industries, while from other users a quietly steady demand has been reported. Quotations are firm throughout the range. With regard to the by-products, pitch, pyridine, and the xylols are probably the quietest sections of an otherwise active trade so far as the call for supplies against contracts is concerned.

GLASGOW.—Business in the Scottish heavy chemical trade was very quiet during the past week, both for home and export. Prices continued very firm. Deliveries of several articles are becoming more difficult.

Price Changes

Rises: Arsenic, carbolic acid, chrometan crystals, coconut oil, cottonseed oil, cresylic acid, formaldehyde, groundnut oil, magnesium chloride, palm kernel oil, sulphur, vermilion, whale oil.

Falls: Antimony sulphide, creosote, naphtha, xylol.

General Chemicals

Acetic Acid.—Maximum prices per ton: 80% technical, 1 ton £39 10s.; 10 cwt./1 ton, £40 10s., 4/10 cwt., £41 10s.; 80% pure, 1 ton, £41 10s.; 10 cwt./1 ton, £42 10s.; 4/10 cwt., £43 10s.; commercial glacial, 1 ton, £49; 10 cwt./1 ton, £50; 4/10 cwt., £51; delivered buyers' premises in returnable barrels, £4 10s. per ton extra if packed and delivered in glass.

Acetone.—Maximum prices per ton, 50 tons and over, £65; 10/50 tons, £65 10s.; 5/10 tons, £66; 1/5 tons, £66 10s.; single drums, £67 10s.; delivered buyers' premises in returnable drums or other containers having a capacity of not less than 45 gallons each. For delivery in non-returnable containers of 40/50 gallons, the maximum prices are £3 per ton higher. Deliveries of less than 10 gallons free from price control.

Alum.—Loose lump, £10 10s. per ton, d/d, nominal.

Aluminium Sulphate.—£10 5s. to £11 5s. per ton d/d.

Ammonia Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Carbonate.—£37 per ton d/d in 5 cwt. casks.

Ammonium Chloride.—Grey galvanising, £22 10s. per ton, in casks, ex wharf. Fine white 98%, £19 10s. per ton. See also Salammoniac.

Antimony Oxide.—£111 to £117 per ton.

Arsenic.—For 1-ton lots, £41 to £46 per ton, according to quality, ex store; for 20-ton lots, £35 to £40 per ton d/d. Intermediate prices for intervening quantities.

Barium Chloride.—98/100%, prime white crystals, £14 10s. to £16 per ton, bag packing, ex works; imported material would be dearer.

Bleaching Powder.—Spot, 35/37%, £11 to £11 10s. per ton in casks, special terms for contract.

Borax, Commercial.—Granulated, £31 10s.; crystals, £32 10s.; powdered, £33; extra fine powder, £34; B.P. crystals, £40 10s.; powdered, £41; extra fine, £42 per ton for ton lots, in free 1-cwt. bags, carriage paid in Great Britain. Borax Glass, lump, £83; powder, £84 per ton in tin-lined cases for home trade only, packages free, carriage paid.

Boric Acid.—Commercial, granulated, £52 15s.; crystals, £53 15s.; powdered, £54 15s.; extra fine powder, £56 15s.; B.P. crystals, £61 15s.; powdered, £62 15s.; extra fine powdered, £64 15s. per ton for ton lots in free 1-cwt. bags, carriage paid in Great Britain.

Calcium Bisulphite.—£6 10s. to £7 10s. per ton f.o.r. London.

Calcium Chloride.—70/72% solid, £5 15s. per ton ex store.

Charcoal Lump.—£10 10s. to £14 per ton, ex wharf. Granulated, supplies scarce.

Chlorine, Liquid.—£22 7s. 6d. per ton, d/d in 16/17 cwt. drums (3-drum lots); 5½d. per lb. d/d station in single 70-lb. cylinders.

Chrometan.—Crystals, 5¼d. per lb.; liquor, £24 10s. per ton d/d station in drums.

Chromic Acid.—1s. 3d. per lb., less 2½%, d/d U.K.

Citric Acid.—1s. 5½d. per lb., normal; imported material, 1s. 10d. per lb. MANCHESTER: 1s. 8d. per lb.

Copper Oxide.—Black, £95 per ton.

Copper Sulphate.—About £31 per ton f.o.b. MANCHESTER: £31, less 2%, in 5 cwt. casks f.o.b. Liverpool.

Cream of Tartar.—100%, £17 2s. per cwt., less 2½%, d/d in sellers' returnable casks.

Formaldehyde.—£24 5s. to £25 10s. per ton d/d. MANCHESTER: 40%, £24 to £26 per ton in casks, according to quantity, d/d.

Formic Acid.—85%, £47 per ton for ton lots, carriage paid; smaller parcels quoted up to 50s. per cwt., ex store.

Glycerine.—Chemically pure, double distilled 1260 s.g., in tins, £4 to £5 per cwt., according to quantity; in drums, £3 12s. 6d. to £4 6s. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, about 1s. 4d. per lb.; free-running crystals are quoted at 2s. 1d. to 2s. 3d. per lb.; carriage paid for bulk lots.

Hydrochloric Acid.—Spot, 6s. 3½d. to 8s. 9½d. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Iodine.—Resublimed B.P., 9s. 11d. to 13s. 11d. per lb., according to quantity.

Lactic Acid.—Dark tech., 50% by vol., £40 10s. per ton. Not less than one ton lots ex works; barrels returnable, carriage paid.

Lead Acetate.—White, £50 ton lots. MANCHESTER: £51 to £54 per ton.

Lead Nitrate.—About £46 10s. per ton d/d in casks.

Lead, Red.—English, 5/10 cwt., £44 10s.; 1 cwt. to 1 ton, £44 5s.; 1/2 tons, £44; 2/5 tons, £43 10s.; 5/20 tons, £43; 20/100 tons, £42 10s.; over 100 tons, £42 per ton, less 2½ per cent., carriage paid, non-setting red lead, 10s. per ton dearer in each case.

Lead, White.—Dry English, less than 5 tons, £55; 5/15 tons, £51; 15/25 tons, £50 10s.; 25/50 tons, £50; 50/200 tons, £49 10s. per ton, less 5 per cent., carriage paid; Continental material, £1 per ton cheaper. Ground in oil, English, 1/5 cwt., £66 10s.; 5/10 cwt., £65 10s.; 10 cwt. to 1 ton, £65; 1/2 tons, £63 10s.; 2/5 tons, £62 10s.; 5/10 tons, £60 10s.; 10/15 tons, £59 10s.; 15/25 tons £59; 25/50 tons, £58 10s.; 50/100 tons, £58 per ton, less 5 per cent., carriage paid.

Litharge.—1 to 2 tons, £44 per ton.

Lithium Carbonate.—7s. 9d. per lb. net.

Magnesite.—Calcined, in bags, ex works, £18 15s. to £22 15s. per ton.

Magnesium Chloride.—Solid (ex wharf), £14 to £18 per ton. MANCHESTER: £14 to £16 per ton.

Magnesium Sulphate.—Commercial, £12 to £14 per ton, according to quality, ex works.

Mercury Products.—Controlled price for 1 cwt. quantities: Bichloride powder, 11s. 7d.; bichloride lump, 12s. 2d.; ammon. chloride powder, 13s. 5d.; ammon. chloride lump, 14s.; mercurous chloride, 13s. 9d.; mercury oxide, red cryst., B.P., 15s.; red levig. B.P., 15s. 6d.; yellow levig. B.P., 14s. 9d.; yellow red, 14s. 4d.; sulphide, red, 12s. 11d.

Methylated Spirit.—Industrial 66° O.P. 100 gals., 2s. 4d. per gal.; pyridinised 64° O.P. 100 gals., 2s. 5d. per gal.

Nitric Acid.—£24 to £26 per ton, ex works.

Oxalic Acid.—£60 to £65 per ton for ton lots, carriage paid, in 5-cwt. casks; smaller parcels would be dearer; deliveries slow.

Paraffin Wax.—Nominal.

Potash, Caustic.—Basic price for 50-100 ton lots. Solid, 88/92%, commercial grade, £55 7s. 6d. per ton, c.i.f. U.K. port, duty paid. Broken, £5 extra; flake, £7 10s. extra; powder, £10 extra per ton. Ex store, £3 10s. supplement. Liquid, d/d £35 per ton.

Potassium Bichromate.—Crystals and granular, 7½d. per lb.; ground, 8½d. per lb., for not less than 6 cwt.; 1-cwt. lots, ½d. per lb. extra.

Potassium Carbonate.—Basic prices for 50 to 100 ton lots; calcined, 98/100%, £52 10s. per ton, c.i.f. U.K. port. Ex warehouse, £55 5s. per ton.

Potassium Chlorate.—Imported powder and crystals, nominal.

Potassium Iodide.—B.P., 8s. 8d. to 12s. per lb., according to quantity.

Potassium Nitrate.—Small granular crystals, £40 to £45 per ton ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 10d. per lb. for 1 cwt. lots; for 3 cwt. and upwards, 1s. 9½d. per lb.; technical, £7 18s. 6d. to £8 10s. 6d. per cwt., according to quantity d/d.

Potassium Prussiate.—Supplies scarce, prices nominal.

Salammoniac.—First lump, spot, £46 per ton; dog-tooth crystals, £50 per ton; medium, £48 10s. per ton; fine white crystals, £19 10s. per ton, in casks, ex store.

Soda, Caustic.—Solid 76/77%; spot, £15 7s. 6d. per ton d/d station.

Sodium Acetate.—£40 per ton, ex wharf.

Sodium Bicarbonate (refined).—Spot, £11 per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 5½d. per lb., anhydrous, 6d. per lb., net d/d U.K.

Sodium Bisulphite Powder.—60/62%, £17 10s. per ton d/d in 2-ton lots for home trade.

Sodium Carbonate Monohydrate.—£21 per ton d/d in minimum ton lots in 2 cwt. free bags.

Sodium Chlorate.—£36 to £45 per ton, d/d, according to quantity.

Sodium Hyposulphite.—Pea crystals, £20 per ton for 2-ton lots; commercial £14 15s. per ton; photographic, £25 5s. per ton.

Sodium Iodide.—B.P., for not less than 28 lb., 9s. 6d. per lb.; for not less than 7 lb., 13s. 1d. per lb.

Sodium Metasilicate.—£16 per ton, d/d U.K. in 1-ton lots.

Sodium Nitrate.—Refined, £15 5s. per ton for 6-ton lots d/d.

Sodium Nitrite.—£21 to £23 per ton for ton lots.

Sodium Percarbonate.—21½% available oxygen, £7 per cwt.

Sodium Phosphate.—Di-sodium, £23 to £28 per ton d/d for ton lots. Tri-sodium, £25 to £30 per ton d/d for ton lots.

Sodium Prussiate.—7¾d. to 8½d. per lb. ex store.

Sodium Silicate.—£9 10s. to £10 12s. 6d. per ton, for 4-ton lots.

Sodium Sulphate (Glauber Salts).—£4 10s. ton d/d.

Sodium Sulphate (Salt Cake).—Unground. Spot £4 8s. 6d. per ton d/d station in bulk. MANCHESTER: £4 13s. 6d. per ton d/d station.

Sodium Sulphide.—Solid 60/62%. Spot, £17 15s. per ton d/d in drums; crystals, 30/32%, £12 7s. 6d. per ton d/d in casks.

Sodium Sulphite.—Anhydrous, £29 10s. per ton; Pea crystals, spot, £20 10s. per ton d/d station in kegs; commercial, £12 to £14 per ton d/d station in bags.

Sulphur.—Finely powdered, £15 to £17 per ton d/d; precip. B.P., 68s. per cwt; ungraded, £16 15s. per ton.

Sulphuric Acid.—168° Tw., £6 10s. to £7 10s. per ton; 140° Tw., arsenic-free, £4 11s. per ton; 140° Tw., arsenious, £4 8s. 6d. per ton. Quotations naked at sellers' works.

Tartaric Acid.—4s. 3½d. per lb., less 5%, carriage paid for lots of 5 cwt. and upwards. MANCHESTER: 4s. 4d. per lb.

Tin Oxide.—Snow white, 305s. per cwt.

Zinc Oxide.—Maximum prices: White seal, £30 17s. 6d. per ton; red seal, £28 7s. 6d. d/d; green seal, £29 17s. 6d. d/d.

Zinc Sulphate.—Tech., £20-£21 per ton, carriage paid, casks free.

Rubber Chemicals

Antimony Sulphide.—Golden, 1s. 2d. to 1s. 10d. per lb. Crimson, 2s. 2d. to 2s. 6d. per lb.

Arsenic Sulphide.—Yellow, 1s. 9d. per lb.

Barytes.—Best white bleached, £8 3s. 6d. per ton.

Cadmium Sulphide.—5s. 9d. to 6s. 6d. per lb.

Carbon Black.—5½d. to 7¾d. per lb., according to packing.

Carbon Bisulphide.—£35 5s. to £40 5s. per ton, according to quality, in free returnable drums.

Carbon Tetrachloride.—£46 to £49 per ton.

Chromium Oxide.—Green, 1s. 6d. per lb.

India-rubber Substitutes.—White, 6½d. to 10d. per lb.; dark, 6d. to 6¾d. per lb.

Lithopone.—30%, £25 per ton; 60%, £31 to £32 per ton. Imported material would be dearer.

Mineral Black.—£7 10s. to £10 per ton.

Mineral Rubber, "Rupron."—£20 per ton.

Sulphur Chloride.—7d. per lb.

Vegetable Lamp Black.—£48 per ton.

Vermilion.—Pale or deep, 15s. 8d. for 7-lb. lots.
Plus 5% War Charge.

Nitrogen Fertilisers

Ammonium Phosphate Fertilisers.—Type B, £13 18s. 9d. per ton in 6-ton lots, d/d farmer's nearest station.

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, June, £10 2s.

Calcium Cyanamide.—Nominal; supplies very scanty.

Concentrated Complete Fertilisers.—£14 8s. 9d. per ton in 6-ton lots d/d farmer's nearest station. Supplies small except C.C.F. Special.

"Nitro Chalk."—£9 14s. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean super-refined for 6-ton lots d/d nearest station, £15 5s. per ton; granulated, over 98%, £14 10s. per ton. Surcharges for smaller quantities unless collected at warehouse or depote.

Coal Tar Products

Benzol.—Industrial (containing less than 2% of toluol), 2s. 4d. per gal., ex works.

Carbolic Acid.—Crystals, 10d. to 11d. per lb. Crude, 60's, 4s. 3d. to 4s 6d., according to specification. MANCHESTER: Crystals, 9¾d. to 11½d. per lb., d/d; crude, 4s. to 4s. 6d., naked, at works.

Creosote.—Home trade, 6d. per gal., f.o.r., maker's works; exports, 6d. to 6¼d. per gal., according to grade. **MANCHESTER: 6¼d. to 9d. per gal.**

Cresylic Acid.—Pale, 99/100%, 4s. 6d. per gal. MANCHESTER: Pale, 99/100%, 5s. 6d. per gal.

Naphtha.—Solvent, 90/160°, 2s. 1d. to 2s. 4d. per gal.; heavy 90/190°, 1s. 9d., naked at works. MANCHESTER: 90/160°, 2s. 4d. to 2s. 8d.

Naphthalene.—Crude, whizzed or hot pressed, £11 3s. to £11 8s. per ton; purified crystals, £19 to £36 per ton in 2-cwt. bags; flaked, £28 to £35 per ton. Fire-lighter quality, £7 10s. to £9 10s. per ton ex works. MANCHESTER: Refined, £19 to £38 per ton.

Pitch.—Medium, soft, 47s. 6d. to 55s. per ton, f.o.b. MANCHESTER: 42s. 6d. per ton at works.

Pyridine.—90/140°, 18s. per gal.; 90/160°, 14s. 6d. MANCHESTER: 14s. to 18s. per gal.

Toluol.—Pure, 2s. 5d. nominal; 90's, 1s. 10d. per gal. MANCHESTER: Pure, 2s. 5d. per gal. naked.

Xylol.—Commercial, 3s. 3d. per gal.; pure, 3s. 6d. MANCHESTER: 2s. 10d. to 3s. 3d.

Wood Distillation Products

Calcium Acetate.—Brown, £21 per ton; grey, £24. MANCHESTER: Grey, £25 to £26 per ton.

Methyl Acetone.—40.50%, £54 per ton.

Wood Creosote.—Unrefined, about 2s. per gal., according to boiling range.

Wood Naphtha, Miscible.—4s. 6d. to 5s. per gal.; solvent, 5s. per gal.

Wood Tar.—£4 to £5 per ton, according to quality.

Intermediates and Dyes (Prices Nominal)

m-**Cresol** 98/100%.—Nominal.
o-**Cresol** 30/31° C.—Nominal.
p-**Cresol** 34/35° C.—Nominal.
Dichloraniline.—2s. 8½d. per lb.
Dinitrobenzene.—8½d. per lb.
Dinitrotoluene.—48/50° C., 9½d. per lb.; 66/68° C., 1s.
p-**Nitraniline.**—2s. 5d. per lb.
Nitrobenzene.—Spot, 5½d. per lb., in 90-gal. drums, drums extra, 1-ton lots d/d buyer's works.
Nitronaphthalene.—1s. 2d. per lb.; P.G., 1s. 0½d. per lb.
o-**Toluidine.**—1s. per lb., in 8/10 cwt. drums, drums extra.
p-**Toluidine.**—2s. 2d. per lb., in casks.
m-**Xylidine Acetate.**—4s. 5d. per lb., 100%.

Latest Oil Prices

LONDON.—April 23.—For the period ending May 2, per ton, net, naked, ex mill, works or refinery, and subject to additional charges according to package and location of supplies: LINSEED OIL, raw, £41 10s. RAPESEED OIL, crude, £46 5s. COTTONSEED OIL, crude, £31 2s. 6d.; washed, £34 5s.; refined edible, £43 10s.; refined deodorised, £44 10s. COCONUT OIL, crude, £28 2s. 6d.; refined deodorised, £35 10s. PALM KERNEL OIL, crude, £27 10s.; refined deodorised, £35 10s.; refined hardened deodorised, £39 10s. PALM OIL, refined deodorised, £41 10s.; refined hardened deodorised, £44 10s. GROUNDNUT OIL, crude, £35 10s.; refined deodorised, £44 10s.; refined hardened deodorised, £48 10s. to £49 10s. WHALE OIL, crude hardened, 42 deg., £30 10s.; refined hardened, 42 deg., £37 10s. ACID OILS.—Groundnut, £19; soya, £17; coconut and palm kernel, £22 10s. ROSIN, 26s. 6d. to 33s. per cwt., ex wharf, according to grade. TURPENTINE, American, 90s. per cwt., in drums or barrels, as imported (controlled price).

General News——From Week to Week

Chemical workers, whose clothing is liable to excessive damage, are reported to be dissatisfied with the Board of Trade's interim offer of 10 additional coupons for protective clothing, and are pressing for 25 coupons.

The Master of the Mint has announced his decision to reduce the proportion of tin used in minting Imperial bronze coinage from 3 per cent. to ½ per cent. This war economy measure will make no difference to the appearance of the coins.

The responsible position of workers who use high-speed steel tools was emphasised by a spokesman of the Ministry of Supply last Saturday, and an appeal was made to works managers to segregate the valuable scrap that is derived from out-of-date tools. Tungsten-containing scrap is especially needed for the manufacture of cutting tools.

"No matter how large or how small your organisation is," says a leaflet issued by the Waste Paper Recovery Association, Ltd., "someone should be appointed as salvage officer, and all members of the staff should be invited to submit suggestions regarding economy in the use of new paper and the 100 per cent. recovery of waste."

A special week-end course of lectures on "Health in the Factory" was held last week-end at the London School of Hygiene and Tropical Medicine. It was attended by many medical officers in industry, and lectures were delivered on "The Nature and Prevention of Toxic Risks," by Dr. R. E. Lane; "The Nature, Prevention and Treatment of Occupational Skin Disease," by Dr. M. Goldblatt; "Protective Clothing and Appliances," by Mr. R. E. Tugman, a chief safety officer, etc. Each lecture was followed by an open discussion.

Firms which are not members of a trade association connected with the paint and varnish industry and are not already in receipt of the form under the concentration of production scheme for that industry, are requested to apply for these forms to the Concentration of Production Department (I. and M.4), Board of Trade, I.C.I. House, Millbank, London, S.W.1. Failure to apply may result in exclusion from the concentration scheme which is now being formulated by the Board for the entire industry.

The Board of Trade has agreed to issue coupons funds to employers enabling them to purchase protective clothing for loan to certain workpeople (male or female), who are engaged intermittently, *i.e.*, outside their normal jobs, on dirty jobs which require such clothing. Employers supplying clothing in these circumstances should write to the Board of Trade, Granville Court, Bournemouth, for application for ASC/DJI. This must be countersigned by one of H.M. Factory Inspectors.

Foreign News

Nylon is being produced in France by Rhône-Poulenc in a plant near Lyons; the output is said to be on a limited scale.

Ciba, the Swiss chemical producing concern, reports for 1941 net profits of 8.20 million francs (1940: 5.87); the dividend is unchanged at 17 per cent.

There is a possibility of finding natural oil in the Union of South Africa, stated Colonel F. C. Stallard, Minister for Mines, moving the second reading of the Natural Oil Bill in the Union Parliament recently.

The creation of industries for the manufacture of raw rubber will be the principal study of the economic commission set up by Brazil and the United States, which has now started work. It will deal also with the industrialisation of the oil-bearing plant known as babassu.

An electrolytic soda plant, Productos Quimicos Mexicanos, has opened in Mexico City, with a capacity of three tons of sodium hydroxide daily. Besides this caustic soda, it turns out potassium chlorate and calcium arsenate as by-products, the latter made from home-produced arsenic, and it also manufactures copper sulphate monohydrate for agricultural purposes.

United States production of manganese ore containing 35 per cent. or more manganese (natural) in January, 1942, was 11,700 long tons, compared with 10,100 tons in December, and an average of about 6300 tons per month in 1941.

A new carbon disulphide plant in Mexico is using sulphur from the San Luis deposits as raw material. This plant will meet requirements of the market for this product, of which 154 tons were imported in 1940.

Production and shipments of molybdenum in the U.S.A. were 3,849,300 and 4,644,000 lb., respectively, in December, 1941, as compared with 3,758,200 and 4,458,600 lb. in November, according to the Bureau of Mines. The average monthly rate of production and shipments in 1940 was 2,859,400 and 2,110,800 lb. respectively.

The Institute of Chemistry hopes to hold its examinations for the Associateship and for the Fellowship in September as usual. Candidates whose applications have not yet been accepted by the Council must forward them to reach the Institute not later than June 15. It is hoped that candidates whose applications have then been accepted, may be informed early in July as to the arrangements for the examinations. The last date for actual entries and payment of examination fees will be July 20.

The expansion in the consumption of caustic soda in Peru which has been evident during the past few years continued in 1941. The United Kingdom and the United States have supplied the bulk of this demand during the past 10 years, as the following recent figures show (in metric tons): 1939, total imported, 2309, U.K. 1259, U.S. 992; 1940, total 2501, U.K. 1696, U.S. 800; 1941 (9 months), total 1774, details not yet available.

Official trade returns from Brazil show that the balance of foreign trade in 1941 was favourable to the extent of 1,215,000 contos, compared with an unfavourable balance of 300 contos in 1940. Imports included the following: non-ferrous base metals 36,636 tons (in 1940, 19,555); mineral salts, caustic soda, and other inorganic chemical products, 85,306 tons (93,933); pharmaceutical and organic chemicals, 42,420 tons (45,627); aniline dyes, essences, and other primary synthetic materials, 6682 tons (4773).

Although America now imports strontium minerals from this country because the normal freight rate for this duty-free material from England to America is $5.90 per ton, as against $16.40 per ton from the Californian deposits to the Atlantic seabord, it has been announced by the Bureau of Mines that there is enough celestine ($SrSO_4$) in the Western Mountain deposits to fulfil the country's requirements at present rates for 350 years. Celestine is used for making tracer bullets, flares, etc., when a brilliant red light is required.

Ceramic tools for cutting wood, glass, stone, concrete, etc., are said in Germany to be superior to steel because they do not heat to as high a temperature from the friction of cutting. They retain their keen edge for a long time, even if they should heat when being used. The basis of the tools, which form the subject of a recent German patent, is a mixture of highly refractive aluminium oxide and chromium oxide. The mixture is moulded into the desired shape, then sintered by heating to a temperature of 1600° C. This bonds the ingredients so that the tool has a fine, hard crystalline structure throughout.

The National Smelting Co., Cleveland, Ohio, has compiled a useful and instructive series of tables of various aluminium casting alloy specifications, which are grouped in accordance with their alloying constituents, starting with the common aluminium-copper alloy. Different specifications are dealt with for sand castings, permanent mould castings and die castings. Chemical analysis can serve as a guide to physical properties and chemical specifications are given, based on experiment and experience, as it has been found that certain prohibited impurities are quite innocuous, while others are actually beneficial.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

COPPER AND ALLOYS, LTD., West Bromwich. (M., 25/4/42.) March 28, charge (supplemental to a charge dated July 19, 1940), to Anthony Gustav de Rothschild and Rothschilds Continuation, Ltd., securing £50,000 (not ex.) (inclusive of amount secured by charge dated July 19, 1940); general charge. £20,000 fluctuating. July 30, 1940.

SLOUGH DRUMS, LTD., London, E.C., keg and drum manufacturers. (M., 25/4/42.) March 30, charge, to National Provincial Bank, Ltd., securing all moneys due or to become due to the Bank; charged on property at Slough.

THOMAS TAYLOR AND CO. (BRISTOL), LTD., Saltford, paint and varnish manufacturers. (M., 25/4/42.) March 26, by order on terms, £2000 debenture, to T. Taylor, Saltford; general charge.

Company News

The Indestructible Paint Co., Ltd., whose dividend payments appeared in our issue of April 11, have now declared profit for 1941 of £37,400 (£38,045).

The Millom and Askam Hematite Iron Co., Ltd., report a net profit for 1941 of £35,286 (£105,858), and have declared on ordinary dividend of 2½ per cent. (10 per cent.).

The British Oxygen Co., Ltd., whose dividend payments were announced in our issue for April 4, now report net profit for 1941 of £808,187 (£955,469).

The Gas Light and Coke Company announce that, after considering the accounts for 1941, they are unable to recommend payment of dividends for that year on the preference, ordinary and maximum stocks. No dividends have been paid on these stocks since the middle of 1940, when 2¼ per cent. was paid on the ordinary stock.

Chemical and Allied Stocks and Shares

STOCK Exchange markets have remained inactive, and in many sections values were inclined to ease in the absence of demand, although the general undertone was again fairly steady, sentiment having been assisted by the very small amount of selling in evidence. All factors considered, the behaviour of markets was regarded as satisfactory, and as indicating confidence in the future and willingness to be prepared to take more than a short view. There is, of course, a widespread tendency to await war developments and a favourable turn in the latter. British Funds again provided the most active section, but in some instances, prices were inclined to ease in accordance with the general trend at the time of writing.

After improving to 33s. 3d., Imperial Chemical eased to 32s. 10½d., which compares with 33s. a week ago, but the quotation is now "ex" the final dividend. On the basis of last year's 8 per cent. dividend the yield compares favourably with that on most other leading securities of industrial companies playing a vital part in the war effort. B. Laporte were again 63s. 9d., and remained firmly held on the hope that the forthcoming results may show the maintenance of the dividend at 15 per cent. Borax Consolidated were less active, but had a steady appearance at 31s., while elsewhere British Glues 4s. ordinary were quoted at 6s. 3d., and business in the preference shares was recorded at 27s. Associated Cement were slightly lower at 44s. 4½d. xd. following publication of the full report, which confirms the reduction from 10 per cent. to 9 per cent. in the dividend. The directors report a slight falling-off in deliveries last year, although demand was strong towards the close of the year, deliveries being made almost entirely in respect of Government requirements. Steadiness at 67s. 6d. was maintained by British Oxygen ordinary units, aided by the full annual report and accounts which show a big increase in the work-in-progress item. Awaiting the dividend announcement, Barry and Staines eased further to 26s. 10½d. and British Match, whose annual results are also impending, were 33s. 9d.

Fison Packard remained at 38s. 9d. and Cooper McDougall at 24s. 6d., while Murex were firm at 92s. 6d., having remained under the influence of the maintained interim dividend. Moreover, Turner and Newall were good, having further improved from 65s. 6d. to 66s. at the time of writing. Awaiting the financial results, Goodlass Wall 10s. ordinary were again quoted at 8s. 9d., while in other directions British Aluminium at 43s. 3d. were within 3d. of the price current a week ago, and British Plaster Board kept at 20s. 9d. Wall Paper Manufacturers deferred units were little changed at 22s. 6d., and Nairn and Greenwich were 53s. 9d. United Molasses 6s. 8d. shares were slightly higher at 29s., the market being hopeful that the forthcoming dividend may again be 20 per cent. The units of the Distillers Co. were higher at 74s. 9d. Lawes Chemical were 8s. 9d., and Greeff-Chemicals 5s. units were around 5s. 7½d., while shares of companies connected with plastics again showed a fair number of dealings. British Industrial Plastics 2s. ordinary were quoted at 3s. 7½d., and Erinoid were 7s. 6d.

Stewarts & Lloyds were little changed at 47s., and there were few movements among other shares of iron, steel and kindred companies. Dunlop Rubber were lower at 25s., the market expecting a reduction in the forthcoming dividend bearing in mind that the company has important interests in the Far East. Estimates range from 6 per cent. to 8 per cent., which would compare with 10 per cent. in the previous year. General Refractories were better at 8s. 10½d., on consideration of the past year's results. Elsewhere, Boots Drug eased to 32s. 6d. and British Drug Houses were 26s. 3d. Among oil shares, Burmah Oil and "Shell" showed a better tendency.

Forthcoming Events

There will be a meeting of the **Institute of Fuel** at the Connaught Rooms, Kingsway, W.C.2, at 2.30 p.m., on **April 30**, when Dr. S. G. Ward and Mr. W. J. Morison will present a paper entitled "Practical Application of Gas Producers to Road Transport, including Passenger Service Vehicles," which will be followed by a discussion.

The Association of Scientific Workers will hold its annual council meeting, on **May 2** and **3**, at the London School of Hygiene and Tropical Medicine, London, W.C.1. The main items for disuccion will be the ways in which scientists and engineers can aid war production, and the need for improved professional status and educational facilities.

The annual general meeting of the London Section of the **Society of Chemical Industry** will be held in the Rooms of the Chemical Society, Burlington House, W.1, at 2.15 p.m., on **May 4.** A paper, presented by H. K. Whalley, B.A., Ph.D., and J. G. N. Gaskin, B.Sc., F.I.C., on "Polarographic Methods of Analysis," will follow.

The Society of Public Analysts will meet at 5 p.m., on **May 6**, at the Chemical Society's Rooms, Burlington House, W.1, when the following papers will be presented and discussed: "The Analysis of Foods containing Meat, Cereal Filler and Soya Bean Meal," by E. T. Illing, B.Sc., F.I.C., and E. G. Whittle, B.Sc., F.I.C.; "The Gravimetric Micro-determination of Magnesium," by P. F. Holt, Ph.D., F.I.C.; "The Iodine Value as an Index of the Relative Firmness of Pig Back Depot Fat," by W. Bolton, M.Sc., and R. G. Baskett, M.Sc., A.I.C.

The Newcastle-upon-Tyne and North-East Coast Section of the **Institute of Chemistry** will meet at the Black Lion Hotel, High Street, Stockton-on-Tees, at 7.15 p.m., on **May 7**, when Professor F. A. Paneth will deliver a lecture on "The Completion of the Periodic System."

The Leeds Area Section of the **Chemical Society** will meet in the Chemistry Department of the University, at 7 p.m., on **May 12**, when Dr. W. H. Mills will deliver the eighth Pedler Lecture, entitled "Recent Progress in Stereochemistry."

"Chemical Engineering in the Laundry Industry" is the title of the paper to be presented by Mr. F. Courtney Harwood at the meeting of the **Institution of Chemical Engineers**, to be held in the Rooms of the Geological Society, Burlington House, W.1, at 2.30 p.m., on **May 12.**

The Plastics Group of the **Society of Chemical Industry** is holding a luncheon at Stewart's Restaurant, at 12.45 p.m. for 1 p.m., on **May 12**, to be followed by the annual general meeting of the Group at 2-2.30 p.m. After this, in the Rooms of the Chemical Society at Burlington House, W.1, there will be a meeting of the Group, when Mr. H. Courtney Bryson will speak on "Some Aspects of the Gramophone Record."

Inventions in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Applications for Patents

Concentration of phosphate minerals from their ores.—A. Abbey (Phosphate Recovery Corporation). 12914.

Processes and product for removing anions.—American Cyanamid Co. (United States, Dec. 6, '40.) 12760.

Polymerisation of esters.—R. G. R. Bacon, R. Hill, J. R. Lewis, and Imperial Chemical Industries, Ltd. 12983.

Resinous compositions.—British Thomson-Houston Co., Ltd. (United States, Oct. 3, '40.) 12724.

Moulding compositions.—British Thomson-Houston Co., Ltd. (United States, Oct. 4, '40.) 12786.

Production of absolute alcohol.—Celec Corporation, Ltd., and S. M. Phillips. 12886.

Insecticides.—Cooper, McDougall and Robertson, Ltd., E. S. R. Willmore, and F. A. Cooper. 12811.

Apparatus for degreasing metal, etc., articles.—R. Cosway and Imperial Chemical Industries, Ltd. 12793.

Production of aliphatic compounds.—H. Dreyfus. 12788.

Production of organic compounds.—H. Dreyfus. 12789.

Manufacture of organic substances.—H. Dreyfus. 12828.

Manufacture of artificial silk.—H. Dreyfus. 12985.

Manufacture of aryloxyalkylamino butanones and butanols. J. R. Geigy A.-G. (Switzerland, Oct. 8, '40.) 12937.

Manufacture of primary amines.—A. H. Knight, W. E. Stephen and Imperial Chemical Industries, Ltd. 12978.

Monoazo dyestuffs.—A. H. Knight, W. E. Stephen and Imperial Chemical Industries, Ltd. 12970, 12980, 12981, 12982.

Coating materials.—J. R. Myles, D. Whittaker and Imperial Chemical Industries, Ltd. 12790, 12791.

Thermoplastic moulding.—J. R. Myles, D. Whittaker and Imperial Chemical Industries, Ltd. 12792.

Manufacture of titanium pigments.—National Titanium Pigments, Ltd., and A. N. C. Bennett. 12893, 12894.

Production of coatings on metal surfaces.—Pyrene Co., Ltd. (Parker Rust-proof Co.). 12821.

Production of coatings on ferrous surfaces.—Pyrene Co., Ltd. (Parker Rust-proof Co.). 12947.

Manufacture of non-leafing aluminium paste.—Reynolds Metals Co. (United States, Oct. 9, '40.) 12871.

Purification of metallic manganese.—Soc. Metallurgica Italiana and P. Guareschi. (Italy, Oct. 8, '40.) 13011, 13012.

Anti-freeze mixtures.—W. H. J. Vernon, F. Worsnwell, E. G. Stroud, and H. C. K. Ison. 12799.

Diamond abrasive articles.—A. Abbey (Carborundum Co.). 13600.

Method and apparatus for separating the components of fluid mixtures.—C. Angela. (Italy, Sept. 25, '40.) 13398.

Recovery of methane from coal measures.—D. Bagley. 13355.

Thermo-setting aminotriazine-formaldehyde condensation products.—British Thomson-Houston Co. (General Electric Co.). 13366, 13367.

Manufacture of transparent alginate films.—Cefoil, Ltd., and R. C. Rose. 13537.

Manufacture of synthetic resins.—N. E. Challenger. 13329.

Processes for purification, etc., of waste oils.—E. J. Church, A. White, and J. A. Shown. 13356.

Method of joining metal articles.—J. L. Colman and Imperial Chemical Industries, Ltd. 13378.

Copper alloys.—M. Cook, W. O. Alexander and Imperial Chemical Industries, Ltd. 13375.

Copper base alloys.—M. Cook, W. O. Alexander and Imperial Chemical Industries, Ltd. 13376, 13377.

Containers for gases, liquids, etc.—H. Davies. 13541.

Manufacture of gas.—H. Dreyfus. 13310.

Apparatus for analysis, etc., of gases.—Geophysical Prospecting Co., Ltd., J. C. Templeton, and L. T. Winkler. 13347.

Metallurgical processes and furnaces.—G. H. S. Grene and Wild-Barfield Electric Furnaces, Ltd. 13485.

Complete Specifications Open to Public Inspection

Process for improving the water-fastness of directly dyed cellulose fibres, and products for use therein.—J. R. Geigy A.-G. April 5, 1940. 10424/40.

Injection moulding powder.—Hercules Powder Co. March 30, 1940. 10720/40.

Mineral concentration.—American Cyanamid Co. March 30, 1940. 2149/41.

Methods of and apparatus for reducing oxides such as metallic ores.—L. Wilson. March 30, 1940. 2337/41.

Production of anhydrous magnesium chloride.—Honorary Advisory Council for Scientific and Industrial Research. April 3, 1940. 3390/41.

Process for the manufacture of derivatives of α-cyano-γ-acetyl-glutaric acid.—F. Hoffmann-la Roche and Co., A.-G. March 29, 1940. 4014/41.

Fluorescent screens and methods for the production thereof. Electrical Research Products, Inc. April 5, 1940. 4141/41.

Bituminous emulsions.—Standard Oil Development Co. March 29, 1940. 4284/41.

Compositions of matter.—British Celanese, Ltd. April 5, 1940. 4412/41.

Plastic compositions and packing devices.—Olaer Patent Co. Feb. 5, 1940. 12397/41.

Complete Specifications Accepted

Preparation of ammonium nitrate and installation for carrying out this process.—Hydro Nitro S.A. and T. Hobler. June 27, 1938. 539,932.

Chromium metallurgy.—M. J. Udy. Dec. 8, 1938. 540,043.

Preparation of alkaline earth metal carbonates in the form of relatively fine slow settling particles.—A. H. Stevens (Pittsburgh Plate Glass Co.). Dec. 7, 1939. 540,044.

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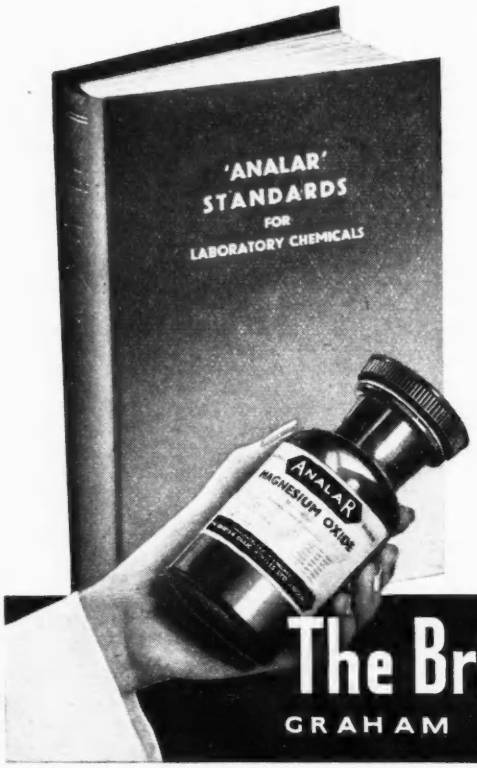

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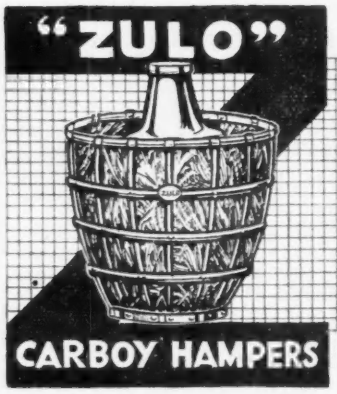

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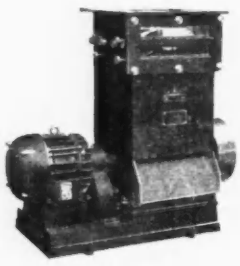

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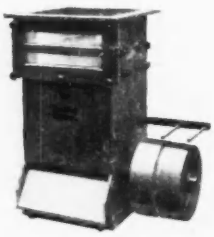

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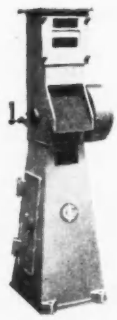

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